ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXIII, No. 14. CHICAGO, SATURDAY, OCTOBER 4, 1913. ISSUED WEEKLY.

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY

608 SOUTH DEARBORN STREET

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SUBSCRIPTIONS.

One Year, United States.....$3.00
One Year, Canada..... 4.00
One Year, Foreign Countries..... 6.00
Single Copy, 10 cents. Back numbers, beyond one month, each .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

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THE CONVENTION OF THE ILLUMINATING ENGINEERING SOCIETY.

The seventh annual convention of the Illuminating Engineering Society, which was held at Pittsburgh, Pa., last week, marks a decided step forward in the science and art of illumination. On the inception of this society in 1906 much doubt was expressed in certain quarters as to the need or usefulness of a new national society which should concern itself exclusively with matters relating to illumination. This doubt has gradually vanished, until today all must admit that this society, no longer an infant, has been of definite usefulness in advancing both the science and art of illumination and that it is one of the main influences in correcting the widely prevalent abuses of artificial lighting and introducing correct methods of illumination.

The attendance at the Pittsburgh convention exceeded that of any heretofore held by the society, and the interest of the members in the papers coming up for discussion was quite marked. A report of these papers and discussions will be found elsewhere in this issue. Mention should be made here of the presidential address, which was an attempt by Mr. Millar to estimate, through the aid of reports from all parts of the country, the present status of illuminating practice. Aside from such aid, Mr. Millar is perhaps equipped better than any other man in the country to formulate such an estimate, and his address, when available in full in the *Transactions* of the society, will constitute a valuable reference, not only at the present time, but for historical information in the future. It is to be hoped that when all the returns secured by Mr. Millar have come in, these data will be available to the membership through publication.

The report of the Committee on Progress this year is notable for the thoroughness with which the technical literature of the past 12 months has been canvassed in order to truthfully portray the advances which have been made since the last annual convention. This report also constitutes a valuable work of reference.

This year's convention was notable in that one day was set aside as "Commercial Day" and was devoted to papers dealing with the commercial application of illumination to the lighting of edifices of all kinds. The material of this nature available for papers was so great that although a five-hour session was held it was impossible to consider all of them in the time allotted, and it would be good policy to devote two sessions to this field at future conventions, for there is probably a

larger quota of the membership interested in papers of this nature than in any other class of papers presented at the conventions. While naturally much of the time at a convention must be taken up with considerations of the development of the sciences involved and the advances in the manufacturing end of the industry, it is in the application of the principles by use of the manufacturers' product that the larger part of the membership is engaged.

Great credit is due to the General Convention Committee and to the local committees for the excellence of the arrangements made for the convention and for the entertainment of the guests of the city.

EFFICIENCY OF THE EYE UNDER DIFFERENT SYSTEMS OF ILLUMINATION.

One of the most interesting papers presented at the convention was that by Prof. C. E. Ferree dealing with the psychology of the eye and its loss of efficiency after continued use under different conditions of illumination. The data presented in this paper were substantially the same as those set forth at Buffalo some weeks ago at a joint session of the Illuminating Engineering Society with the International Congress on School Hygiene, and commented upon in these columns in the issue of September 6. It was there pointed out that the results given are only preliminary in the sense that all of the variables entering into the problem have not yet been considered to the extent which is essential to the formulation of definite conclusions regarding the effect of different lighting conditions upon the efficiency of the eye.

In the experiments so far carried out, daylight and three different installations of artificial lighting have been used and variations have been made in the intensity of the light obtained from these different sources. The results may be summed up by saying that throughout the range of the conditions of testing, daylight and indirect lighting caused very little loss of eye efficiency. On the other hand with a semi-indirect installation the efficiency of the eye after three hours of use was found quite low except for one particular intensity of illumination and even here it was lower than with the above schemes of illumination. With the system of direct lighting installed there was a similar optimum intensity, but the effect upon the eye was worse throughout than with any of the other methods of illumination.

An important point brought out in the discussion at the Pittsburgh meeting was as to whether the important variable in the experiments was the intensity of the illumination or whether it might not have been the surface brightness of the sources of light which were within the field of vision. Since changes in the intensity were brought about by varying the size of the lamp unit, keeping the shades and reflectors fixed, the element of glare as defined in terms of the contrast between the surface brightness of the source and its surroundings was varied at the same time as the intensity. The question naturally arises as to whether the same results would be obtained if the surface brightness had been kept constant while the intensity was varied. In the semi-indirect installation, for instance, if the surface brightness had been kept at the value for the optimum while the intensity was varied, would not the eye have functioned equally well under all intensities?

It is apparent from Dr. Ferree's work that eye efficiency cannot be so well maintained where bright sources are within the field of vision as where they are excluded, but it is evident that too hasty conclusions should not be drawn, and that the definite criterion as to whether a given installation will produce eye fatigue and loss of efficiency cannot yet be formulated. The further pursuit of these experiments will be eagerly followed by all interested in the subject of good lighting and in the discovery of the conditions of artificial illumination which will be least detrimental to the eye and most conducive to the conservation of vision.

INCANDESCENT-LAMP ADVANCES.

The recent announcement of an incandescent electric lamp with a specific consumption of one-half watt per candle, or even less in the larger sizes, has opened speculation as to what the general effect upon electric lighting will be when these lamps have been placed upon the market and established their position in the art. The advantages of filling the incandescent bulb with nitrogen gas increase with the current-carrying capacity of the filament, and with the long thin filaments of the small sizes it is more of a detriment than a benefit. It is consequently in large units, such as may be used for street lighting or the lighting of other large areas such as are found in work shops, that the new type of lamp will come into sharp competition with other forms of illuminants. The incandescent lamp has for some years been seriously invading the street-lighting field, and with a unit of high efficiency—an efficiency that approaches that of the flaming arc lamp—the competition between these two forms will necessarily become more acute.

The incandescent lamp has an advantage in requiring less attention than the arc lamp, and it is to be expected that maintenance costs will consequently be less. On the other hand, the very lack of the necessity for regular inspection and trimming may lead to the neglect of proper cleaning, with a resulting marked deterioration in efficiency under the customary conditions of use. It must be borne in mind, too, that the arc lamp is still in the evolutionary stage, and the next year or two may seriously modify its characteristics. It is already possible to obtain white-flame electrodes giving as good efficiencies as were obtained previously with the yellow-flame electrodes. Moreover, by operating either the magnetite arc or the flaming arc at higher wattages, and consequently higher candlepowers, their efficiencies can be improved over the usual operating values, and these forms of lamp therefore resemble the new incandescent lamp in the possibility for better efficiencies in the larger units.

The probability of new developments in these two

types of electric lamps and the recent invasion of the field of large-unit lighting by the quartz-tube mercury-vapor lamp, renders it hopeless to prophesy what the relative status of these lamps may be a year or two hence, but it is gratifying that the illuminating engineer is being supplied with a variety of forms of electric lamp of high efficiency, for undoubtedly each of them will eventually find a useful field of operation.

In the smaller sizes of incandescent lamps the use of filaments wound into the form of a close helix has resulted in a lamp which is better adapted to certain uses than the older style of filament, owing to the concentration of the source in a very small volume. For use in projection work, as in stereopticon lanterns, headlights and light houses, and in photometry, where the ideal source would be a mathematical point, this is a great advantage. Even for use with ordinary reflectors where the distribution of the light is less intensive, there is an advantage in concentration of the source, since reflectors under these circumstances can be more accurately designed to give any desired distribution. The use of this lamp for such purposes as moving-picture work will introduce an element of safety where heretofore there has been considerable danger in the form of fire hazard.

It is found that this disposition of the filament tends to strengthen rather than to weaken it and there is no reduction in life when burning at the usual efficiency.

TOURING BY ELECTRIC AUTOMOBILE.

A good many conspicuous runs outside the field of city and suburban operation are being recorded in these days by people interested in the development of the electric automobile, and there is no longer any question that when central-station managers in small towns lying between the larger centers of population awake to the wisdom of standing ready to charge batteries at any hour of the day or night, the electric pleasure car will at once come into its own as the most convenient, reliable, simple and desirable means of touring the older parts of the country on at least a modest scale. One of the latest and most significant of these runs was made recently by Col. E. W. M. Bailey, of Boston, to the Burlington convention of the New England Section of the National Electric Light Association, and the results of this trip, referred to in last week's issue, demonstrate conclusively that nothing but the question of securing charging facilities stands in the way of a remarkable expansion of electric automobile service.

Colonel Bailey made the trip from Boston to Burlington at an average speed of 19 miles per hour, over a route almost entirely new to him, up hill and down dale, over rough Green Mountain country and smooth Massachusetts highways, past serious road obstructions and through sand sometimes so thick as to be troublesome to even a gasoline car, and was out but one night, covering the road distance between the two cities in 13.6 hours, actual running time. Upon arrival he stated that the time could be much reduced on a second trip over the road, and pointed out that the secret of long-distance touring by electric pleasure cars is an occasional battery charge of moderate duration, rather than operation to the "battery empty" point.

The ease of control of the electric roadster, its superior freedom from the troubles which always threaten the man with the engine-driven gasoline car, its quiet operation and, in present designs, its excellent speed characteristics, are sure to appeal to the discriminating motorist when he can be certain to find charging facilities awaiting him in every town having a representative central-station service. On a single charge a modern electric roadster will run from 75 to 100 miles over all sorts of roads, and this distance is ordinarily enough to satisfy the requirements of the tourist for the greater part of a day. If the car owner desires to make a longer trip, it is not a serious matter to stop for a boosting charge at a high rate during the luncheon hour, and even a half hour's charging at some center in the morning or afternoon helps materially and at the same time enables the passenger to get out and "stretch his legs" with the result of arriving at the destination far less tired than when continuously in the car from morning to night.

Now in the face of records of this kind, it is time for the central-station man to do his part, and if he cannot arrange a neat little installation of battery-charging equipment by using his exciter for this service at a cost which is too small to consider, he must be indeed lacking in enterprise. It ought not to be necessary for an electric automobilist to telephone ahead from a point several hours' run away in order to secure the required charge on arrival. We are inclined to think that most central-station men will go out of their way to accommodate the cross-country driver of an electric automobile in the particular rare instances when such a machine comes along; but what is really needed is a readiness-to-serve policy which will make the purchase of a charge as simple a matter as the buying of five or ten gallons of gasoline from the village grocery—a continuous availability of the charging apparatus at all hours and at a fair price. With the increase of day service even among the smallest central stations, the time has passed for indifference or sluggishness in the matter of being ready to charge vehicle batteries at 2 a. m. as well as at 6 p. m. through simple home-made flexible connections and resistances whose cost is nominal. Of course, the electric automobiles will not come until the small central station is prepared to charge them; the latter must get into line and be ready for the business, and the ultimate profits are already clear to the far-sighted student of eletcric-vehicle development.

Meeting of International Electrotechnical Commission.

The second plenary meeting was held in Berlin, Germany, from September 1 to 6. It was attended by some 70 delegates from 24 nations, five of which were Spanish-speaking countries. Amongst several official government delegates were those of Canada, India and Great Britain.

In the regrettable absence of Dr. E. A. Budde, the president of the Commission, Dr. E. Warburg, president of the Physikalischtechnische Reichsanstalt, presided at the official opening. On behalf of the German Government an address of welcome was given by Dr. Lewald, director in the Ministry of the Interior. In conformity with the custom of the Commission a chairman was elected to preside over the unofficial meetings, at which the work of the various special committees, appointed at Turin, was considered in detail. C. O. Mailloux, president of the American Institute of Electrical Engineers, was unanimously chosen for this post.

Previous to the official opening, each special committee had held a very full meeting to discuss the modifications to their reports which for several months past had been before the various national committees. The special committees were presided over by S. P. Thompson (Nomenclature), S. Strecker, (Symbols), Mr. Huber-Stockar (Rating), and Dr. Zoelly (Prime Movers).

As regards nomenclature, a list of some 80 words and definitions was adopted. This does not appear as a great accomplishment, but it nevertheless represents much conscientious work on the part of the members and has needed several preliminary sittings, two of which were held in Cologne, one in Paris and one in Berlin. Further progress toward international nomenclature may be recorded in the fact that the commission has decided to add German and Spanish equivalent terms with their definitions to this list of terms.

Dr. Warburg presented, in person, a report on the question of an international standard for copper, the recommendations in the report having been drawn up by R. T. Glazebrook, in consultation with the national laboratories of America, France and Germany. The adoption of this report will have the result that all future tables for copper will be calculated on an identical basis, a material advantage to all concerned.

A number of definitions dealing with the terminology of water-power plants in conjunction with electrical machinery were adopted.

A list of 36 symbols was adopted, together with a number of guiding rules relating to symbols generally.

The name "siemens" instead of the "mho" is to be put before the Congress on the Applications of Electricity to be held in San Francisco in 1915.

The rating of electrical machinery gave rise to a prolonged and intensely interesting discussion. It will be remembered that a special committee to study the subject was appointed at Turin in 1911 and that the committee has met in Paris and in Zurich. At Zurich certain limiting temperatures for modern insulating materials were put forward, and broadly speaking these have been adhered to.

Much discussion centered around the question of the ambient or cooling-air temperatures. The distinction between the ideal rating, which is useful for the purposes of comparison, and the available output, which is dependent on the geographical position, came out clearly in the debate. The majority of delegates were in favor of 40 degrees Centigrade as the limit of the cooling-air temperature, but two delegations preferred 35 degrees Fahrenheit. As it was not possible to arrive at a decision on this important point, involving as it does the fundamental question as to what temperature rise shall be allowed in first-class modern electrical machinery, the Commission, rather than force a vote on a subject not yet ripe for decision, very wisely referred this particular point back to the national committees.

It is hoped that a definite decision, satisfactory to all, may be arrived at in San Francisco in 1915. Reference was made to the progress of the organization for the 1915 Congress and the American delegates expressed the hope that they would be able to welcome a large gathering of foreign electricians.

Maurice Leblanc was unanimously elected the new president, and the statutes having been modified accordingly, he will assume office for two years. Colonel Crompton was re-elected honorary secretary. The Spanish delegates invited the special committees to hold their next meeting in Madrid and the Russian delegate, on behalf of this committee, invited the Commission to meet in St. Petersburg in 1917.

The hospitality and courtesy of the Germans is so well known that all that need be said is that every care had been taken for the comfort and entertainment of the foreign guests.

The Berlin meeting will certainly rank as a significant success in the movement towards international unification in electrical affairs.

Annual Meeting of Chemical Engineers.

The annual meeting of the American Institute of Chemical Engineers will be held in New York City, December 10 to 13. At this meeting officers will be elected for the ensuing year.

Electrical Development Association Dissolved.

A meeting of the Executive Board of the Electric Development Association was held on September 16, at Boston, Mass., and it was unanimously decided to discontinue further activity as an association and to close up the office which has been maintained in the Exchange Building.

In reaching this decision the Executive Board was influenced solely by the fact that a national society has been incorporated for the same purpose—The Society for Electrical Development. This society will accomplish over the entire country what the Electric Development Association proposed to do for New England when it was established early in the year 1912. The Board considered it unnecessary to duplicate work of this kind and preferred to turn the support of its subscribers to the national society. The secretary of the Electrical Development Association has been Zenas W. Carter.

The Society for Electrical Development has now had pledged about three-fourths of the entire working fund of $200,000, which must be subscribed before the movement can proceed. No pledges become binding until this amount has been secured. The membership of the Society on September 24 was 575.

Samuel Insull Addresses Electric Club.

About 225 members and guests of the Electric Club of Chicago were present at the meeting on September 25, at which Samuel Insull, president of the Commonwealth Edison Company, was the principal speaker, thus establishing a new attendance record for the club. Mr. Insull spoke interestingly of business conditions in the electrical industry during the past year, with special reference to conditions in Chicago. It is significant, he said, that the electrical industry encountered less financial difficulty during the past year than any other industry, this being a good indication of the stability of the business.

Referring to commission regulation of utilities, Mr. Insull said that companies and public would be mutually benefited if the personnel of the commission is made up of men selected for their fitness for the work rather than for the payment of political obligations. Such a commission, he said, should lay aside consideration of day-by-day conditions and from the start should take such action as will assure for all time free opportunity for capital to be invested in public-service corporations and to insure their obtaining a reasonable return.

Bion J. Arnold, of Chicago, spoke briefly of Mr. Insull's activities, in the way of a response.

Charles O. Bond.

The recent convention of the Illuminating Engineering Society at Pittsburgh has served to again focus the attention of the world upon the progress which has been made in scientific research and practical application in artificial illuminants. A large part of the credit for the concrete results along lines of betterment which have been secured must be given to the effective work which has been carried on by and in the name of the society. Much remains to be done, and it is therefore a source of congratulation that Mr. Bond has responded to the call, and assumes the mantle of responsibility as president for the ensuing year of the Illuminating Engineering Society.

Charles O. Bond was born November 15, 1870, near the town of Lehigh, Webster County, Iowa. He was graduated from the United States Naval Academy, Annapolis, Md., in 1890. After graduation he served one year at sea on board the United States Ship *Enterprise* and United States Ship *Philadelphia*, resigning from the Navy in 1891. He later taught school in the states of Iowa and New York for five years, and in 1897 became connected with the United Gas Improvement Company in Philadelphia. In 1898, during the Spanish-American war, he served five months as an ensign in the Navy on board the United States Ship *Lancaster* and the United States Ship *Newport*. At the close of the war he resumed his connection with the United Gas Improvement Company, taking charge of the photometric work of the company. While continuing in this position, he also held command of one division of the naval force of Pennsylvania for three years. Since 1909, Mr. Bond has been manager of the photometrical laboratory of the United Gas Improvement Company, which was established in that year.

Mr. Bond was a charter member of the Illuminating Engineering Society and has served one term as a director and one term as a vice-president. He is also a member of the British Illuminating Engineering Society, the American Gas Institute, the National Commercial Gas Association and the Franklin Institute of Pennsylvania. Mr. Bond was an American delegate to the International Photometric Commission in Zürich in 1911. and has always taken an active interest in the work of the Commission.

Charles O. Bond,
President of the Illuminating Engineering Society.

Pennsylvania Electrification.

The Pennsylvania Railroad has announced that it will electrify the suburban division between Broad Street Station, Philadelphia, and Chestnut Hill. This division has a length of 12 miles. It was decided some time ago to electrify the main division from Philadelphia as far as Paoli, the terminus for surburban trains.

The railroad company has been seriously considering the purchase of electrical energy for the operation of these divisions, and it is not likely that another power house will be erected.

The work on the Chestnut Hill division is expected to be completed in one year. There are now 85 trains per day between Paoli and Philadelphia, and 66 trains on the Chestnut Hill branch.

Stability in Aeronautics.

At the meeting of the American Society of Mechanical Engineers in New York City on October 14 a paper will be presented on "Stability in Aeronautics" by Albert A. Merrill, founder of the Boston Aeronautic Society and lecturer at the Massachusetts Institute of Technology. The meeting will be held in the Engineering Societies Building at 8:15 p. m., and will be preceded by an informal dinner, members meeting in the rooms of the Society at 6:15 p. m.

Program for October Meeting of American Institute.

The 286th meeting of the American Institute of Electrical Engineers will be held in the auditorium of the Engineering Societies Building, New York City, October 10, at 8:15 p. m. Two papers will be presented on "Tungsten Lamps of High Efficiency," by Irving Langmuir and J. A. Orange. The first paper describes investigations into the cause of blackening of the bulbs of tungsten lamps and discusses methods whereby the blackening is avoided and the efficiency of the lamps increased. The second paper describes in detail the new types of high-efficiency tungsten lamps which have been produced by filling the bulbs with nitrogen, and it is expected some of these lamps will be shown in operation.

At the close of the technical session the meeting will adjourn to the Institute offices on the tenth floor, where a smoker will be held and refreshments served.

The 287th meeting will be held in Philadelphia, Pa., on October 13. Sessions will be held at Drexel Institute in the afternoon and evening, and papers will be presented by Charles Fair on "Electric Drive in Machine Shops"; by H. P. Liversidge on "Industrial Substations"; and by P. M. Lincoln on "Relation of Plant Size to Power Cost.' The electrical engineering laboratories of the University of Pennsylvania will be inspected between sessions.

Pittsfield Considering Municipal Plant.

Public hearings have been held at Pittsfield, Mass., on the subject of the advisability of the city's purchasing the plant of the Pittsfield Electric Company. Statistics showing the cost of electricity generated at the Holyoke and Westfield municipal plants were presented. Ex-Mayor H. D. Sisson expressed his personal opinion that too much politics exist in city affairs today to make it desirable that more municipal undertakings be entered upon.

The manager of the company, W. A. Whittlesey, and Samuel G. Colt, a director, took exception to some of the figures which had been offered to show lower costs of electricity in municipal plants, and stated that the company is owned and conducted altogether in Pittsfield and that it has always been the policy of the directors to keep the plant in a high state of efficiency rather than pay high dividends.

La Maison Electrique.

English gas-supply authorities have combined in making a striking display at the White City show, London, with a view to impressing the public with the cheapness and suitability of their commodity.

A few of the electricity undertakings have put their heads and finances together and have arranged that during the run of the said Gas Exhibition they will have La Maison Electrique as a counter-attraction a little distance away, at Olympia, where the Ideal Home Exhibition, which always attracts hundreds of thousands of people, will be in progress. A fully equipped electric house will contain the most striking features of the successful La Maison Electrique in Paris. These are being brought over to London specially, and their principal feature will be an electric dining table illustrating how a perfect dinner may be perfectly served without the visible intervention of servants. It is expected that Monsieur Knap's dining table with its combination of electrophone, periscope, service elevator and traveling rails, also its tasteful decorative details will act as a magnet drawing the public from all corners of the Olympia Building. The House having an old English style of appearance, will have its entrance and exit through a garden forecourt dressed daintly with climbing roses and flowering plants, and containing an ornamental fountain illuminated from below by means of colored lights.

Parties will be conducted through the different compartments in the following order: pantry, kitchen, business offices, dressing and bathroom, bedroom and dining room. There will be over 100 different electrical appliances and devices in use in these rooms and a staff of about 30 attendants will answer questions and otherwise diplomatically press home the merits and economies of electrical service. The conclusion of the attendant's duties will be to conduct the party for whom he has acted as guide, to the dining table referred to above, giving them an opportunity of taking part in its operation.

Every style of electric lighting for domestic service will be in evidence, and in some rooms special ceilings will display indirect and semi-indirect fittings, and, of course every kind of apparatus for heating, cooking, ventilating, ironing cleaning, polishing and other operations will be seen, the bigger articles being kept constantly at work in the charge of special attendants.

A strong feature is to be made of specially prepared literature and posters suited to such an occasion. One hundred thousand copies of a thirty-page booklet on domestic electric service will be distributed, a number of manufacturers having lent their assistance in connection with this part of the scheme. Four thousand specially designed art posters showing the house will be prominently displayed in the areas of the electric supply authorities concerned.

The Ideal Home Exhibition will be open from October 9 to 28.

Kansas City Electric Plant.

The municipal lighting plant in Kansas City, Kans., has been running now for about eight months and is adding to its connected load every day. In addition to supplying city needs, this plant supplies domestic customers at a rate of six cents per kilowatt-hour with a monthly minimum of 75 cents.

The plant contains two turbogenerators, and a third is being installed. The capacities of these are 500, 1,000 and 2,500 respectively.

Annual Meeting of Vehicle Association.

The fourth annual meeting of the Electric Vehicle Association of America will be held at 55 Duane Street, New York City, on Tuesday, October 14, at 2:30 p. m.

The annual convention is to be held in Chicago on October 27 and 28.

Buffalo Electrical Show.

An electrical show will be held in Buffalo, N. Y., during the second week of March, 1914. The Elmwood Music Hall will be used for the purpose, as it is a large building well adapted to such an exposition. All of the electrical interests of Buffalo are working together to make the show a big success.

Illuminating Engineers to Meet With Gas Institute.

The Illuminating Engineering Society will hold a joint meeting with the American Gas Institute at the Hotel Jefferson, Richmond, Va., on October 17. Arrangements for this meeting are in the hands of a committee of which W. J. Serrill is chairman.

Cable House at Halifax.

At Halifax, N. S., Canada, the Western Union Telegraph Company will build a cable-supply house to cost about $50,000. It will be a concrete structure 98 by 138 feet and two stories high. Its equipment will include an electric hauling engine.

Marconi Company Acquires Goldschmidt Patents.

The Marconi Company has made an announcement in London that it has acquired a majority interest in the French company which owns the rights of use of the Goldschmidt wireless inventions including his high-frequency alternator, in all parts of the world except Germany.

New Kern River Projects.

Secretary Houston of the Department of Agriculture has granted a permit to the Southern California Edison Company for the development of additional electric power on the Kern National Forest to supply Los Angeles, Pasadena, and neighboring towns. The company operates seven hydroelectric plants, one of which is on the Kern and five others on the Angeles National Forest. The six plants are capable of developing 37,000 horsepower, although there is not sufficient power in the streams to develop such an amount of power continuously. The company has installed, therefore, a number of auxiliary steam plants, which have a total capacity of about 54,000 horsepower.

While it might be supposed that, with such an amount of power at the company's command, there would be little need of an additional supply, especially with other companies operating the same territory, the Edison Company was convinced several years ago that it would eventually need more power in order to supply its market. The four water-power sites which seemed to be the most valuable for development are in the Kern forest, so application for power permit was made through the Forest Service, in order that the company might develop these sites.

The four projects mentioned in the permit are designated by the company as Kern River plants 2, 3, 4 and 5. It is expected that plant No. 3 will be the first to be put into operation, with 4, 5 and 2 following in the order given as the demands for power increase. It is stated by the company that expensive dams will not be needed, but that the construction of some of the conduits will be difficult and will require a considerable amount of time. Because of this, and also because of the large investment required and the large amount of power that is involved in the development, the Department of Agriculture allows a period of almost 12 years before the plants will have to be in complete operation.

According to the estimates of the Government's engineers, the four new projects of the company will be able to supply almost 33,000 horsepower, except for a few days in a period of five years. It is planned to install machinery which will have a total capacity of more than 80,000 horsepower. This will be transmitted at high tension over a distance of about 155 miles.

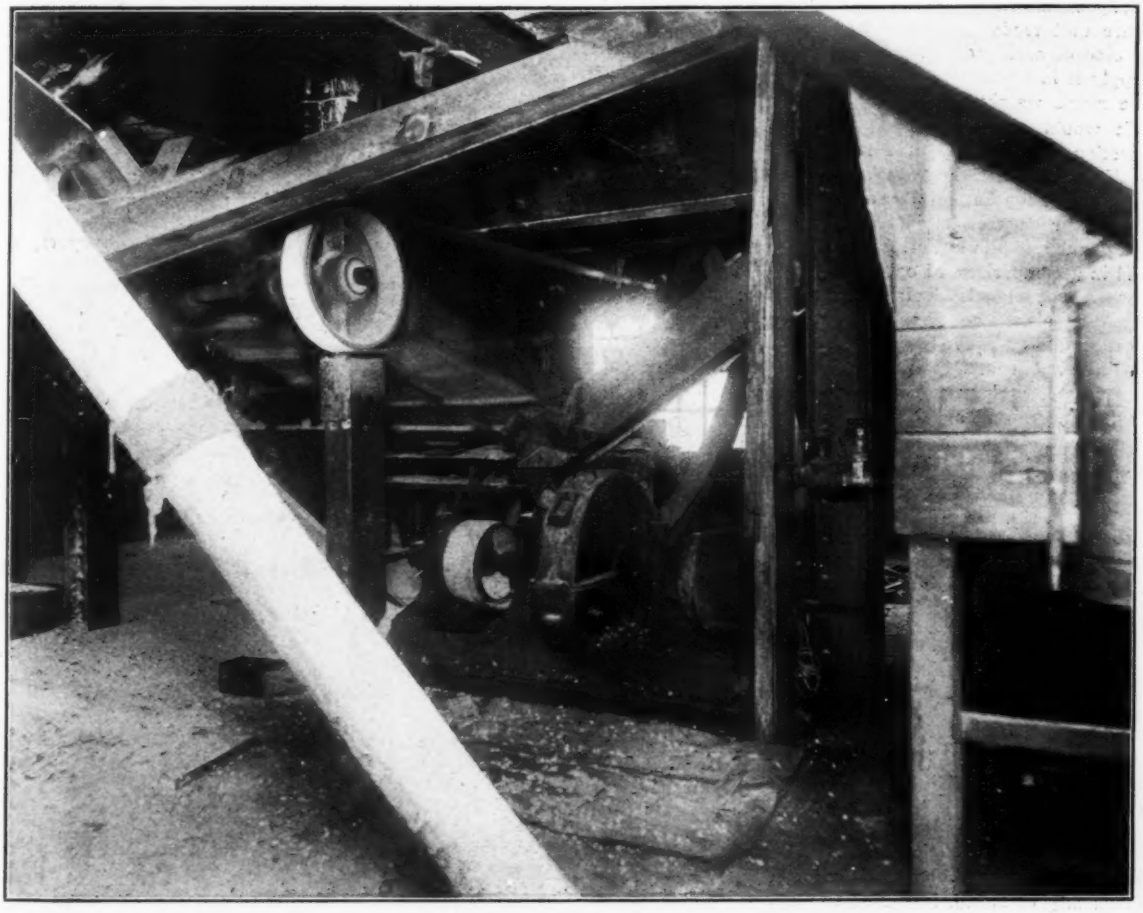
Electricity in Salt Mines.

As in other industries, electric drive with central-station service has superseded steam drive in salt mines, resulting in greatly reduced operating costs, better grade of product due to uniformity of speed and absolutely reliable operation under all conditions. These advantages are discussed in detail herewith and data given on several installations.

While the bulk of the salt used in this country is produced by evaporating processes, there are still in existance several salt mines where the rock salt is mined and prepared for the market in a manner similar to processes involved in producing crushed stone, coal, etc. As in other industries, electric drive with central-station service has superseded steam drive, in the majority of cases, and the results have been greater operating economies, increased production, better quality of product due to uniform speed of crushers, and minimum interruptions and annoyance.

While, strictly speaking, the operations involved in mining and preparing salt are peculiar to that industry, in so far as motor applications are concerned, the advantages of motor drive so universally known in other fields apply with equal force in salt plants. The one difficulty encountered in applying motors to salt mining machinery, namely the tendency of sodium chloride to affect the insulation and casings of the motors, has been overcome by the manufacturers supplying totally inclosed motors with brass frames. Such motors have been operating in the salt mines in the Detroit district with excellent success.

In considering the advantages of electrical operation the most important consideration is reliability of service. As in other mines pumping and fan service must be rendered continuously and an interruption may result in grave danger to the workmen or damage to the property. Breakdowns are by no means uncommon with isolated steam plants and at salt mines, usually located in districts unfavorable to plant operation, there is greater possibility of mishap than in the city. An isolated steam plant, even if built in accordance with the best practice and equipped with efficient, modern machinery so as to provide the maximum possible assurance against interruption to service, is dependent in reliability upon the reliability and resources of a single engineer. Hence the element of risk is great, especially as no plant can afford to maintain an emergency operating crew to take charge in case of disability of the regular operators; or to maintain such a supply of material and repair parts that will be sufficient to take care of any emergency. On the other hand, the reliability of central-station service has been proven beyond doubt. The production and marketing of power is the sole reason for the existence of the



Motor-Driven Scalping Machine in Mill of Detroit Salt Company.

35-Horsepower Motor Direct-Connected to Blower in Salt Mine.

central station, consequently every effort is made by the management to improve the service in every possible detail. A complete shut-down is practically unknown as there is always a spare unit ready to be put in service in case of accident. The reliability of supply is in no respect dependent upon one man's watchfulness.

It would seem, therefore, that the question of reliability of supply is in itself of sufficient importance to dictate the adoption of central-station service, but further justification for the abandoning of the steam plant may be had in a comparison of operating costs between steam and electric drive. In the first place the temporary nature of the mine makes it inadvisable, from an investment standpoint, to provide a separate equipment of boilers and engines simply for the operation of the pumps. Therefore the entire plant must be operated 24 hours a day, although only a small amount of power is required at night. This condition also applies on Sundays and holidays when the mine is idle. The savings effected by the substitution of motor drive are readily apparent. Motor-driven pumps require practically no attention so that at night and on days when the mine is idle the labor costs may be entirely eliminated. The elimination of operating expenses of the isolated plant and the smaller investment in motors than in boilers, engines, etc., also make the total net savings of considerable proportions.

Advantages of electric drive, such as flexibility, adaptability, cleanliness, uniformity of speed, increased production, etc., are all of importance in influencing the substitution of motors for steam drive, but are too well known to need special comment.

In connection with the horsepower requirements of the various machines used in salt mining, attention is called to an installation in a typical mine, located near Detroit, Mich., purchasing power from the Detroit Edison Company. The production of this mine averages 600 tons per day of ten hours and comprises principally, rock salt for use in ice-cream manufacturing, packing plants and pickling.

A substation has been built on the mine property, containing transformers and switchboard. Alternating-current motors of the squirrel-cage induction type, totally inclosed and provided with brass casings, are used throughout the plant. The voltage of the mine circuits is 220.

The first operation in mining salt is to break the rock into sizes suitable for handling. This is done in the Detroit mine by means of electric drills, there being six installed. Direct current for their operation is supplied by 22-kilowatt generator, driven by a 25-horsepower motor running at 1,200 revolutions per minute.

The salt thus mined is raised in buckets to the top of the mill where it enters a series of crushers, screens and pulverizers, falling by gravity into the proper bins and hoppers.

A 200-horsepower motor, running at a speed 900 revolutions per minute is installed for driving the mill proper, the connected load being as follows:

One 30 by 36-inch salt crusher, made by the Link-Belt Company.

One 30 by 30-inch crusher.

One 18 by 20-inch crusher.

Four sets of 30 by 20-inch by 16-foot shakers.

Two sets of 30 by 8-inch by 16-foot shakers.

Two 36 by 12-inch by 11-foot scalping machines.

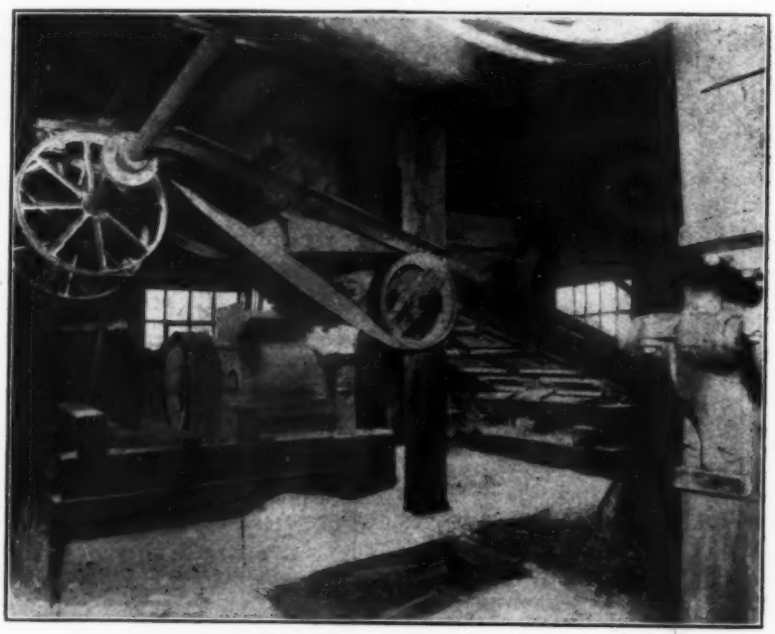
One bucket elevator, 90 feet high, buckets 20 by 7 inches.

One bucket elevator, 68 feet high, buckets 22 by 7 inches.

One 30-inch Foos mill.

One 24-inch Foos mill.

Two 9-inch screw conveyors, each



Motor-Driven Shakers and Salt Crushers.

eight feet long; and one 10-inch screw conveyor, 22 feet long.

Pumping is taken care of by two six-inch, six-stage bronze centrifugal pumps, pumping 400 gallons per minute against a 650-foot head, each driven by a 225-horsepower motor running at 1,200 revolutions per minute.

There is also a Gould triplex 8 by 10-inch pump installed for raising water from lower level of the mine to the 650-foot level. This pump is operated by a 40-horsepower motor running at 1,800 revolutions per minute. These pumps run continuously and the company holds in stock an extra 225-horsepower motor to be used in case of an accident.

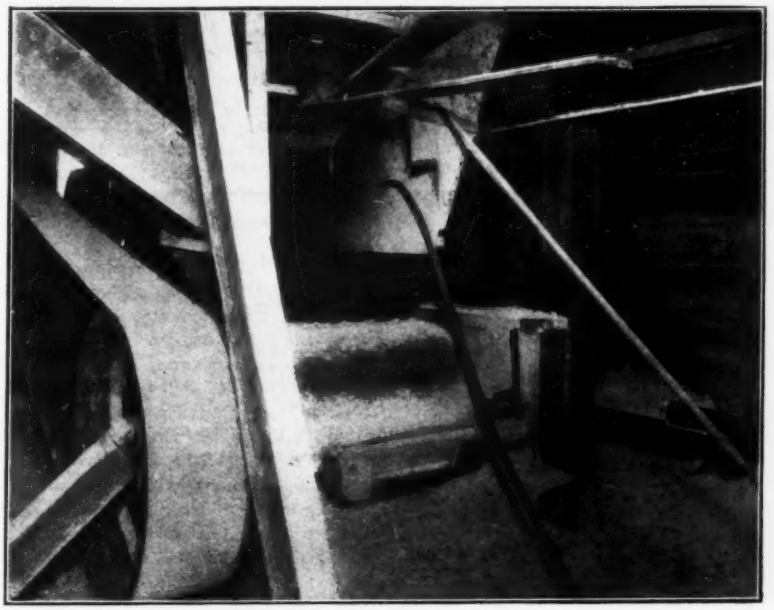
The ventilation of a mine is an important feature and continuity of service is absolutely essential. At the mine under discussion a 35-horsepower motor running at 1,730 revolutions per minute is direct-connected to an American No. 120 blower. A duplicate blower driven by a steam engine is held in reserve, although it is significant to note that this equipment has not been called into service since the adoption of electric power.

In addition to the motors mentioned there is a 10-horsepower, 1,200-revolutions-per-minute machine installed in the carpenter shop, driving band saws, emery wheels, etc.

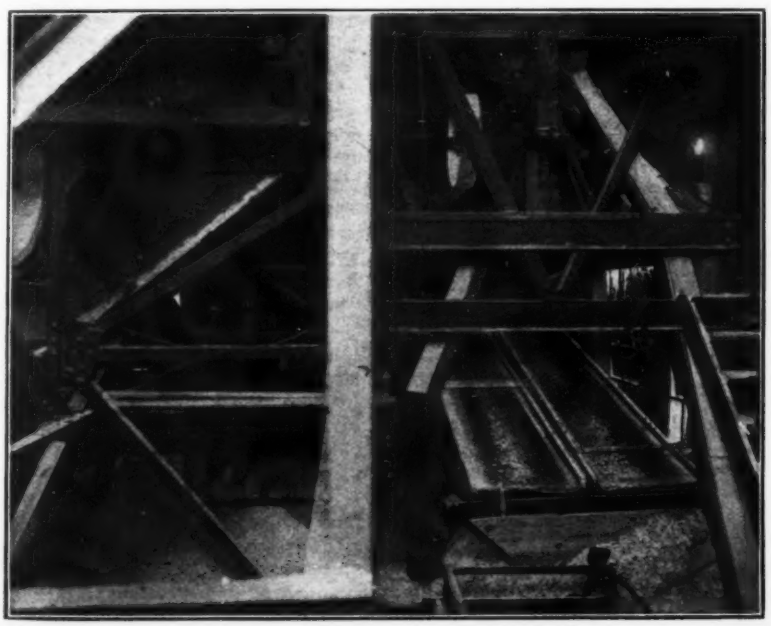
At the time this mine was visited an 800-horsepower steam hoisting engine was still in use, although the substitution of motors for this service was contemplated. This engine is supplied by a boiler installation of 1,400 horsepower capacity.

The grouping of machinery in this mine may be considered typical of the practice in this industry. Pumps, blowers, hoists, etc., are without exception equipped with individual motors usually geared or direct-connected. The horsepower requirements are well known for this equipment.

Group drive is universally employed for the mill proper as all conveyors, crushers, screening machines, etc., are operated in unison. Special machines used only in producing special grades of salt should be supplied with separate motors. Additional data will be found in the accompanying sheet.



Motor-Driven Salt Crusher at Detroit Salt Works.



Motor-Driven Shakers for Screening Salt.

Domestic Appliance Campaigns in New England.

The United Electric Light Company, of Springfield, Mass., and the Manchester (N. H.) Traction, Light & Power Company are both conducting publicity campaigns for the introduction of household electric appliances. The Manchester company is using in the local newspapers large spaces to demonstrate "Scientific Management in the Household," giving examples from day to day of how time, money and labor can be saved by the use of the various devices. The advertising states that an electric flatiron used continuously costs about six cents per hour, on the 12-cent maximum rate. When the residence bill exceeds $2.28 per month, the cost of the service is only three cents per hour, the secondary rate being 6 cents per kilowatt-hour.

The Springfield Company points out the advantages of the electric grill, a combination device that grills as well as fries, toasts, and boils, right on the table. A hasty breakfast or an afternoon tea may be served easily and delightfully with the aid of this compact household appliance. The cost of operation is reckoned at about six cents per hour, and a two-year guarantee covers any defects. Both companies report satisfactory returns from this publicity.

Flat Rates for Apartment Houses.

A lady approached the clerk at the central-station office in Jamestown, N. Y., and complained that the company was not charging her on a flat rate. She thought she was entitled to a flat rate, she said, because she lived in a flat.

Salt Mining Data.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Salt mine producing rock salt for ice-cream manufacturing, for salting and packing houses, etc. The average output is 600 tons per day of ten hours.

Total connected horsepower, 760. Total number of motors installed, 7. Average kilowatt-hours per month, 30,570.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	21,300	May	28,500	September	45,400
February	23,600	June	30,600	October	28,100
March	25,700	July	28,000	November	45,300
April	25,700	August	34,300	December	30,300

Load-factor, 8 per cent; operating-time load-factor, 20 per cent. (Pumps operate 24 hours per day, including Sundays and holidays).

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power	Speed R. P. M.	Application.
1	25	1,200	Direct-connected to a 22-kilowatt direct-current generator supplying energy to six Scranton salt drills used in the mine.
1	35	1,800	Direct-connected to an American No. 120 blower.
1	200	900	Belted to shafting driving one Link-Belt Company's No. 1, 30 by 36-inch salt crusher; one Link-Belt No. 2, 30 by 30-inch crusher; one Link-Belt No. 3, 18 by 20-inch crusher; four sets of 30-inch by 20-inch by 16-foot shakers; two sets of 30-inch by 8-inch by 16-foot shakers; two 36-inch by 12-inch scalping machines; 90 feet of bucket elevator, 20-inch by 7-inch buckets; one 68-foot belt conveyor, 22-inch belt; one 30-inch Foos mill; one 24-inch Foos mill; two 9-inch screw conveyors, eight feet long; and one 10-inch screw conveyor, 22 feet long.
2	225	1,200	Each direct-connected to a six-inch six-stage centrifugal pump, capacity 400 gallons per minute against a head of 650 feet.
1	40	1,800	Direct-connected to a Gould triplex 8 by 10-inch pump, relays water from lowest mine level to 650-foot level.
1	10	1,200	Belted to line shafting driving machines in carpenter and machine shop, comprising band saw; two emery wheels; one drill press; and one small lathe.

Energy for this installation is supplied by the Edison Illuminating Company of Detroit.

An 800-horsepower steam engine is used for hoisting purposes, but it is contemplated by the owners to replace this with electric motors, at any early date.

Salt mine producing rock salt for commercial purposes. The average daily output is 400 tons per 10 hours.

Total connected horsepower, 900. Total number of motors installed, 6. Average kilowatt-hours per month, 41,100.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-Hours	Month	Kilowatt-Hours	Month	Kilowatt-Hours
January	39,700	May	28,100	September	43,500
February	48,400	June	34,800	October	33,600
March	55,400	July	36,500	November	49,100
April	41,600	August	37,000	December	46,200

Load-factor, 10 per cent; operating-time load-factor, 18 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power	Speed R. P. M.	Application.
2	35	1,800	Each direct-connected to an American No. 120 blower.
1	225	1,200	Direct-connected to a six-stage six-inch centrifugal pump working against a 600-foot head. Capacity, 400 gallons per minute.
1	400	900	Geared direct to hoisting mechanism for operating bucket hoists.
1	200	900	Belted to line shafting driving three salt crushers, two 36 by 30-inch, one 18 by 20-inch; four sets of shakers; two 24-inch Foos mills; one 10-inch screw conveyor, 30 feet long; two 40-foot bucket elevators; one 22-inch belt conveyor; and one 36-inch by 12-inch scalper.
1	5	1,200	Belted to a line shaft in machine shop, driving two 16-inch emery wheels; one small drill press; and one lathe.

Commercial Practice
Management, Rates, New Business

RATES.[1]

By L. H. Conklin.

There is no part of our business probably which has been the subject of so many papers as the rate question, and I venture to state, there is no part of our business on which there has been so much disagreement, both as to principle and fact. There are only three or four papers which really stand out prominently in the history of this subject, and they were more or less turning points in their time. These papers and others treated the subject analytically and from a technical standpoint, each in the attempt to show what the service costs and how the cost should be distributed. This was done largely of our own volition, for our own guidance and profit in developing the business, but we have now reached the time where we have not only ourselves to consider, but the regulating public. We are not being tried before the bar of our own judgment, but are forced to persuade the other fellow, who is, more frequently than not, non-technical and who cares very little for the arbitrary pro-rating of expenses or other of our pet hobbies. These representatives, who are regulating our affairs, while sincere and just, do not look at the problem from an owner's standpoint, and in attempting to get the best results for the public, whom they represent, they are very apt to waive our carefully constructed theories aside, and approach the matter from an entirely different angle.

Bared to the light of cold, hard reasoning, it is surprising how flimsy some of these theories appear. It is no longer only necessary to prove to our own satisfaction that our theories are correct, but we are confronted with the problem of persuading others than ourselves, so we must stop theorizing and get down to facts. We must determine first what we are after, then all work toward that given end. We must face this fearlessly and not attempt to deceive ourselves, neither must we feel it is necessary to continue to make mistakes in order to substantiate our previous statements.

The Rate Research Committee of the National Electric Light Association, found early in their deliberations, it was quite impossible, even though they could agree among themselves, to make much headway by attempting to discuss this question as a whole, but they found there were many points which could be decided to their mutual satisfaction, and were surprised, finally, to discover that, when their ideas were classified and formulated, they disagreed on many points only in matters of language and not in fact. It is surprising further, when a large number of rates, which at first glance are widely different, are analyzed out, to find they are similar in principle and in many cases, identical, simply different ways of expressing the same thing.

If we can direct our attention toward the standardization of our forms and language, we will find the points on which we differ will become fewer and fewer, and we will thus narrow our discussions down to questions of fundamentals until they too are all agreed upon.

One of the first things we must keep clearly in mind in going before commissions or the public, is the distinction between rates and the rate of return. Rates constitute schedules by which we adjust the income between different classes of customers. The rate of return is the percentage of profit we make, or are supposed to make on the whole investment. The factors which determine one may have nothing whatever to do with the other, for instance, the valuation of the property, however determined, has only to do with the rate of return, and in no way fixes the relation of the rates, one to the other. It does not benefit us any in fixing the price for charging a storage battery, to know that the value of our plant amounts to a million dollars; on the other hand, we are particularly interested in knowing the value of our plant if we wish to demonstrate that we are not making an adequate return on our investment.

This question of valuation has become a burning one, and we should all study it most carefully. Recent decisions of the various commissions have become more liberal in elements which go to make up the value of a property, and the tendency is to permit the companies to capitalize certain intangibles, which at first were peremptorily dismissed. In valuing a plant, there are certain intangibles which everybody must admit, and which we as owners and operators, must be firm in insisting upon. While it is a debatable question whether we should be permitted to capitalize franchises, these being in the gift of the public, still there are other intangibles which have an undisputed value and should be permitted as a part of the valuation.

Our plants, when they were started, had no assurance of being a success, and the original investors are entitled to a profit for the risk they assumed. There was a period in their early life during which they were operated at a loss, and for a long time did not return the interest on the money the investors were entitled to receive. There were also losses, through bad debts and disasters. Securities were sold below par, with a stock bonus, because they could not be sold otherwise, yet none of these are represented in the physical value of the plant, but are there none the less, and should not be dismissed as a loss to the present owners.

The sum of these intangibles, added to the value of the plant, gives the amount upon which some rate of return must be earned. Just what that rate of return will be is still in dispute, but the tendency is that it will be higher than early practice seemed to indicate.

The gross profits, in addition to earning the rate of return permitted on the values as represented in the capital, must also create funds for certain other more or less arbitrary factors, such as depreciation, obsolescence, inadequacy of apparatus, losses during the development period, funds for accidents, disaster and financial losses etc. These are the things about which we are going to be placed on the defensive in the future and it is best to approach them boldly and become more universal in our opinions as to the value and justice of each. While it is undoubtedly our object to get as high a net rate of return as possible, we must agree on our methods and reasoning, for we are confronted with the ways and means of accomplishing this.

In the filing of our rate schedules, we will be forced to show why we did this and why we did that, so in preparing them we must agree on the governing principles, and then work collectively to accomplish our ends. In my judgment, we have been going at this question in the wrong way.

[1] From a paper presented before the recent convention of the Pennsylvania Electric Association, Delaware Water Gap, Pa.

We have been endeavoring to substantiate our position on theoretical assumptions, none of which will bear close analysis, instead of facing the issue squarely and boldly stating we are getting all the traffic will bear for the general good of all, and then endeavoring to show why it is fair to all.

We have all heard and read a great deal about the apportioning of costs to different customers and classes of customers, so as to make each one pay his proportion of the cost of serving him. This would be fine if all the costs varied in proportion to one unit or even several units, but to take all the variables into account makes the problem so complex, it is abandoned and average quantities used. It is practically impossible to arrive accurately at just what it cost to serve each customer. It is less of a problem, however, to arrive at the cost of serving a class of customers, especially if we assume for purposes of cost distribution, we have all of the customers in that class connected, and then establish a development rate which will get all this business. The first few customers, in order to secure them, must be taken below cost, that is below the average cost but still above the additional or increment cost of carrying them. Are they a profit or a loss? Finally when all in that class have been obtained, the profits will be large, because even the early ones pay more than the increment cost of serving them. When all are obtained the resulting profit can be used to reduce rates on other classes of service not yet developed, help to reduce all or some particular rates, or to bring up the rate of return nearer to where it should be. These customers are taken below the average cost, yet contribute to the profits. They are given a lower rate than that given to other classes, yet it could not be called unjust discrimination, for without the profit from this business, other rates would be higher, or the rate of return on the investment less than is fair to the investor, and furthermore the particular class in question is getting the service cheaper or better than it could get elsewhere, otherwise we would not have obtained this business.

The most apparent example of the above is the way our lighting companies have developed the two great classes i. e., light and power customers. Starting as lighting companies, they induced power customers, not on the cost of service, but on the value of the service theory. They could not get the business on the cost of service, because they were obliged to take it at less than their average cost; they did not use the increment cost, because they could obtain more money than that. The result has been, lighting rates have been reduced through profits made on power business, and power rates have been reduced because more business has been obtained, thus reducing the costs per unit to all.

If each class of customers pay all the service is worth to them, regardless of the cost to the company of serving them (excepting always that the rate will not bring the service to less than the increment cost, plus a profit) then the station will get the fullest return for its service and be able to reduce the cost to all lower than if deprived of the full contribution of any class or classes. Because rates are lower to one class, it should not make the other class feel badly, for if a given class were quoted a rate higher than it could afford to pay (that is, more than the service is worth to it), then the station would not get the business and resultant profit from this class, and rates would be still higher to the remaining classes, assuming a given rate of return on the investment.

So if we are to give a community full value in service, the stockholders the full return on their money, we must adjust rates between classes of business, so as to get the fullest contribution from each class. Classes may be made, from a value of service standpoint, on their load-factor or off-peak use. The nature and amount of their output may be the basis of other classes, such as pumping, ice-making, etc. Class distinction may be made arbitrarily by the customer's ability to pay, as in freight rates or doctors' bills. Just how these classes are to be determined rests largely with us, as we will give it the closest study, and if we will recognize the necessity for such distinctions, we can substantiate them as just and equitable to the community as a whole, which, after all, is the only thing in which the community is interested.

The expressions, class rates, and getting all the traffic will bear, have harsh sounds in presenting these matters to the general public, and some softer expressions should be chosen, yet it is not hard to find precedence for both in everyday practice in other than our own business. We find many examples of class rates in the most familiar transactions, for instance: the postal service makes a different rate for carrying books and newspapers, yet they are both printed matter. Some hotels make different rates for masters and servants, even though they eat at the same table and sleep in the same kind of rooms. Railroads have different rates for carrying a ton of coal and a ton of gravel, yet all these classifications are good and react to the benefit of the public as well as to the profit of the company.

We must educate ourselves and the public to recognize that anything which results in good to all is neither discriminatory nor unfair, and if we sell service to any class below what the service is worth to that class, we are really making the other classes pay more for their service than they should pay because if the class who is getting the service for less than they are willing or able to pay, were made to pay what the service is really worth to them, then they would contribute more to the profits of the company, and thus the company would sooner, than otherwise, be able to reduce the rate to the other classes. This is the principle which makes class rates fair, and fortunately it is being recognized among some of the commissions, particularly the older ones, such as New York, Massachusetts and Wisconsin. If we, individually and collectively, study this phase of the question very thoroughly and are enabled to persuade these regulating bodies that this is a fair and just way of looking at the situation, we will accomplish more, in my judgment, than in any other way, toward getting all the business possible at the cheapest rate possible, and give the best satisfaction to the community served.

It is a popular theory that electric companies have a monopoly in their respective communities. While it is true they have a monopoly of the electric service from a central station, they by no means have a monopoly of the light and power business. They are in keen competition with gas and other methods of producing light and power. In other words, if our service charge is too high, a man will either use some other method to get the result, or dispense with the service altogether. We do, however, enjoy a monopoly of the use of the streets, and we should not abuse the privilege. We should consider it the proper function of our companies to serve our communities with the best possible service at the lowest cost which will enable us to earn a fair return on our investment, and provide for other proper charges, and we should not resent the fact that we are open to regulation by commissions, or otherwise, in the interest of the public, but we should so conduct our business that this regulation becomes purely perfunctory. We should anticipate the demands of the public through voluntary reduction of rates when we can give them. We should be absolutely just in our distinction between classes, and treat each customer absolutely the same as we would treat any and all

others in his class. We should take the public into our confidence as far as possible in the fixing of these rates, as between classes, and not be afraid to show why these distinctions have been made. If they have been made fairly we have nothing to fear.

We should all endeavor to prepare our rate schedules in the same manner, and there has been, I believe, no better form suggested than that recommended by the Rate Research Committee of the National Electric Light Association. The mechanical arrangement of our rates in one universal form will do as much for the rate problem as the classification of accounts has done for the accounting problems of our business. If we would all prepare our rate schedules in this accepted form, we would find, instead of having several hundred different forms of rates throughout the country, the number would be greatly diminished, for we would be surprised to find that many of our rates, while seemingly different, are only different as to language and presentation.

If we would all publish our rate schedules and have them open to the public, we would find many vexing problems disposed of. It would not be a question of fencing with each individual customer as to the rate we should quote him, with the conviction on his part if he sticks to it long enough, he will get a lower rate. With a published schedule, we can simply refer him to it, and it fixes his rate automatically, according to where he appears on the schedule. We can then confine our talk to the excellence of service and other considerations. The public would not feel, individually or collectively that they were being discriminated against, for any one of the rates is open to any individual on the condition only that he fall in the class that the particular rate covers.

This is being forced upon many companies who are now under the jurisdiction of a commission, and it has been found a blessing in disguise. Even though not required to do so by law, it will be found very beneficial to publish schedules anyway, as it eliminates much of the mystery and distrust between the public and the company. The commissions throughout the country, with possibly a few exceptions, have shown a tendency to work in harmony with the companies and not be unfair in their rulings. There is considerable ignorance on the part of the commissions, however, on the subjects of rate making, valuations and rate of return, which is in no way their fault as we ourselves are by no means unanimous on many of the points on which the commissions have been forced to make rulings.

Facts and Factors of a 5,150-Kilowatt Central Station.

The following facts and factors were taken from the operating records of an electric light company located in an Eastern shoe manufacturing city and serving a territory having a population of about 104,800 people. The company's generated energy during the last fiscal year was 10,462,360 kilowatt-hours, of which 6,830,358 kilowatt-hours were sold. Its boiler plant consisted of six 400-horsepower Babcock & Wilcox water-tube units and two 350-horsepower units of the same make, the total boiler rating being 3,100 horsepower. The engine equipment included three E. P. Allis Company's units direct-connected to General Electric generators of 450-kilowatts each, one Allis-Chalmers engine direct-connected to a 800-kilowatt machine, and two 1,500-kilowatt General Electric turbogenerators. The station force is comprised of the following: one station superintendent, one chief engineer, four engineers, six firemen, four oilers and cleaners, two coal passers, four switchboard operators, three station inside wiremen and one dynamo cleaner and sweeper. Current is generated at 2,300 volts. Both single and three-phase motors are in use.

The tabulated data are as follows:

YEAR ENDING JUNE 30, 1912.

Fuel cost	$47,919.81
Oil and waste	916.35
Water	3,136.38
Station wages	22,133.89
Station building repairs	5,488.63
Steam-equipment repairs	9,022.75
Electrical-equipment repairs	449.74
Station tools and appliances	272.78
	$89,340.33
Kilowatt-hours delivered at the switchboard	10,462,360.
Kilowatt-hours sold to customers (total)	6,830,358.
Kilowatt-hours sold for power	3,531,452.
Kilowatt-hours sold for commercial lighting (meter)	3,298,435.
Kilowatt-hours sold for commercial lighting (contract, estimated)	9,421.
Kilowatt-hours for street lighting	1,305,700.
Kilowatt-hours used by the company	374,895.
Kilowatt-hours unaccounted for (per cent)	18.7
Gross earnings	$439,346.88
Earnings from motor load	87,028.57
Earnings from street lighting	74,653.20
Net earnings	194,307.68
Earnings from commercial lighting	277,665.11
Total operating expenses and taxes	245,039.20
Total cost of system	1,648,688.
Total cost of steam plant	296,682.
Total cost of electrical generating plant	205,626.
Fuel cost, per kilowatt-hour (cents)	0.46
Wages per kilowatt-hour (cents)	0.21
Oil and waste, water, tools, station repairs, steam plant and electrical repairs, per kilowatt-hour (cents)	0.18
Net cost of manufacture, per kilowatt-hour (cents)	0.85
Population	104,800.
Consumers per 100 of population	6.9
Station rating, kilowatts	5,150.
Station rating per station employee	198.
Station rating per capita (kilowatts)	49 2.
Ratio of station rating to connected load (per cent)	38.6
Average load during operation, kilowatts	1,192.
Ratio of average load to station rating (per cent)	23.2
Annual load-factor (per cent)	32.
Investment per kilowatt of rating	$319.
Investment per capita	15.7
Gross income per kilowatt of rating	85.3
Gross income per consumer	60.6
Gross income per capita	4.2
Gross income per $100 invested	26.6
Gross income per kilowatt-hour generated (cents)	4.2
Gross income per kilowatt-hour sold to customers (cents)	6.4
Ratio of expense to gross income (per cent)	55.8
Net earnings per $100 invested	$11.80
Total hours of operation for the year	8,760.
Connected load, incandescent lamps (kilowatts)	8,167
Connected load, commercial arc lamps (kilowatts)	322.
Connected load, street arc lamps (kilowatts)	283.
Connected load, commercial motors (kilowatts)	4,549.
Connected load, total	13,321.
Number of commercial motors on June 30, 1912	884.
Average rating of commercial motors (kilowatts)	5.2
Earnings from street lighting per kilowatt-hour sold (cents)	5.7
Earnings from power output per kilowatt-hour sold (cents)	2.5
Earnings from commercial lighting per kilowatt-hour sold (cents)	8.4

Brooklyn Post Office Adopts Central-Station Service.

The United States Government, through the Secretary of the Treasury, has approved a contract with the Edison Electric Illuminating Company, of Brooklyn, for the exclusive supply of electric light, heat and power to the Brooklyn Post Office and Federal Building. This means the complete replacement of the steam heating, compressed air, hydraulic and electrical plants at present installed.

The apparatus replaced consists of three high-capacity boilers, three large electric generators, three standard upright automatic engines, three duplex steam-driven air compressors and two hydraulic elevators. It also covers the complete supply of compressed air to the tube delivery of the mail between Brooklyn and other borough post offices in the city.

This plant was replaced following careful engineering investigations by the Edison Company, covering a period of several months, and after exhaustive comparisons by Government engineers between the relative economies and advantages of private plant operation and Edison service.

Edison Power in the New York Subways.

The New York Edison Company is supplying power to all of the contractors engaged in the underground tunneling for New York's new subway system. This power is used in drills, derricks, concrete mixers, air compressors, etc. Twelve different contractors are building the different sections of the Broadway-Lexington Avenue subway, which will be the main artery of the system. Each of these contractors is purchasing power from the New York Edison Company.

Electrical Construction

DIRECT-CURRENT DYNAMO AND MOTOR TROUBLES.

A Note on Difficulties Encountered in Starting First Run on Machines of This Type.

Dynamo Troubles.—Most manufacturers of direct-current generators have each machine rather carefully tested before it leaves the factory, and when a generator is sold it is customary for them to furnish the buyer with a diagram showing how it is to be connected in circuit. Thus the process of getting the dynamo ready for service is rendered rather simple. Nevertheless, the electrician who has not had much experience in such work is liable to have trouble when he undertakes the initial run on a dynamo. The commonest trouble is the refusal of the generator to build up its voltage properly and hold it when the load is thrown on.

This may be due to any of the following causes: (1) accumulation of some poorly conducting substance under the brushes; (2) loose or improper connections somewhere in the path of the field current; (3) armature speed low; (4) rotation of armature in wrong direction for existing connections; (5) brushes in the wrong position; (6) connection of shunt and series fields such that the effect of one of these windings opposes that of the other; (7) loss of residual field charge.

(1) Before attempting to place a new generator in circuit at all the operator should always make sure that the commutator and the bearing surfaces of the brushes are clean, and that the brushes fit the commutator snugly. The commutator can be cleaned by first holding the rough side of a piece of fine sandpaper on it, while the machine is driven at a low speed, until the surface is smooth and bright, and then applying a piece of clean cloth in the same way for a minute or so. While the brushes are usually ground in during the test at the factory, it is not a bad plan to repeat the process briefly when the dynamo is to be put in service. To grind a brush in one should take a piece of fine emery cloth or sandpaper a little wider than the width of the brush in the direction of the length of the armature, and, having slipped this under the brush with the smooth side of it held against the commutator, draw it quickly back and forth until the brush has been ground clean and to a good fit.

The application of vaseline, machine oil and commutator compound to the surface of a commutator is a practice that can be very easily abused. One of the most puzzling experiences that the writer ever had occurred when the voltage of an alternator that he was bound to keep running began rather suddenly to swing between about 500 and 3,000 volts; it was finally found that the disorder was due to the fact that an assistant had put an excessive quantity of a commutator lubricant on the commutator of the exciter.

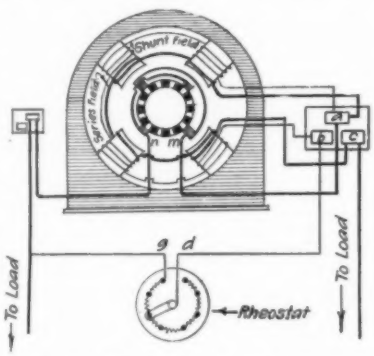


Fig. 1.—Connections for Compound-Wound Generator.

(2) It is easy enough to sketch the proper connections of a direct-current generator on paper; but when the connections have to be made on a switchboard crowded with wires and apparatus, as is frequently the case, improper connections or failure to observe loose connections is a thing that is quite liable to happen. For example, it will sometimes happen that the connection of the shunt field is made from the rheostat terminal *g*, back to the right-hand conductor in Fig. 1.

Time can usually be saved by going over the field and armature connections very carefully before the generator is started. A case is recalled in which a new dynamo installed on a foundation from which an old one had been removed, and connected to the wiring of the old machine, refused to pick up voltage. The wiring ran vertically upward to the ceiling and thence over to the switchboard. After the usual worry and loss of time it was discovered that the copper of the shunt-field lead had been broken within the insulation without the break having become visible.

(3) The remedy for low speed is apparent; the speed should be tested before any attempt is made to get up voltage.

(4) If there is a voltmeter at hand that is at all sensitive, it should generally be easy enough to discover the trouble when a generator is started up in a direction opposite that for which the shunt-field connections have been made; due to the residual magnetism of the generator field, there will usually be a small deflection of the voltmeter needle at first; but this will grow less as soon as the attendant begins to cut resistance out of the shunt-field circuit by manipulating the shunt-field rheostat. The reason for this is, of course, that reversal of rotation reverses the polarity of the brushes and thus tends to send a current around the shunt field in such a direction as to weaken the residual magnetism of the field poles rather than strengthen it. Thus, if brush *m* in Fig. 1 is positive with say clock-wise rotation of the armature, the direction of the shunt-field current will be from *a* to the upper right-hand field pole and around the field to *b*, and thence through the rheostat and back to brush *n*; whereas, with the same field polarity and counter-clockwise rotation of the armature, the course of the shunt-field current would be *n-g-d-b* and around the field in the opposite direction.

(5) Tests for correct position of the generator brushes can be made by shifting the brushes back and forth and noting the effect on the voltage.

(6) If the shunt and series fields oppose each other in a compound-wound dynamo, that fact will become apparent as soon as anything like full load is thrown on the machine: the voltage will drop far below its rated value. In a case of this sort the best procedure is to change the series-field connections so as to reverse the direction of the series-field current. Thus, in Fig. 1, the end of the series winding attached to *c* is transferred to point *a*, while the series-winding terminal shown connected to *a* is moved to *c*. It is clear

that if the leads from the brushes to the block connectors are not disturbed, the direction of the shunt current will not be affected by this shifting of the terminals of the series winding. Sometimes electricians change the connections at the brushes instead of beyond the point where the shunt field is tapped off, which, of course, leaves the windings in opposition as before.

The writer once had to set up an interpole motor, which was to be used as an exciter for an alternator, for rotation in a direction opposite that for which the connections had been made in the factory, and the machine was so designed that it was next to impossible to get at the connections of the leads at the brushes or to tell just how they were brought out to the soapstone terminal block from which connection to the switchboard was to be made. A hurried change was made in the exciter connections which was found to make the exciter build up its voltage and hold it steady enough for satisfactory running of the alternator. A few days thereafter, however, an attendant was very much puzzled when attempts of his to increase the alternator voltage by reducing the resistance in the alternator-field circuit caused the voltage of the alternator to drop. It was found that cutting more of the resistance back into the alternator field and cutting out more of the shunt-field rheostat of the exciter would bring up the voltage on the alternator to the desired value. As soon as these units could be laid off the connections were gone over carefully and properly adjusted.

(7) Loss of residual magnetism in a standard direct-current dynamo seems to be a rather unusual sort of an occurrence. When a field is to be recharge care must be taken not to put excessive voltage upon it, and not to burn out the armature of the generator nor any of the apparatus on the switchboard. In other words, the attendant should make sure that only the shunt-field winding and whatever resistance is needed in series with it—if any—is connected to the source of charging current.

Motors.

What has been said concerning the cleaning of the commutator and the fitting of the brushes on a direct-current dynamo applies also to the direct-current motor. The procedure is the same in both cases.

The direct-current motor with which the average electrician has most to do is of the shunt-wound type, the typical arrangement of the wiring to which type of machine is shown in Fig. 2. Before an attempt is made to start such a machine, by cutting out the resistance installed in series with the armature, a test should always be made to see that the field circuit is not open. This can be done by opening the motor switch and watching for an arc at the switch contacts, or by holding a pair of pliers, or other iron tool near a field pole and noting whether there is attraction or not, the absence of attraction indicating that the field circuit is open. If the field is intact, the starting resistance can be gradually cut out and the motor thus started up.

To a motor of this type the connections are very simple. Perhaps the commonest mistake in connecting up a shunt motor is that of attaching both terminals of the field to the same side of the supply line—that is, of connecting the end of the field winding shown attached to the right-hand side of the line to the side in which the starting

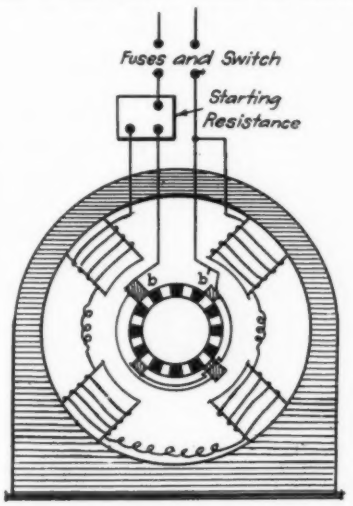


Fig. 2.—Diagram of Connections for Shunt Motor.

resistance is inserted. A motor connected in this fashion will usually start up as the starting resistance is cut out if it is arranged to start without load, but there will be trouble when any load is thrown on, if indeed it does not occur as soon as the starting lever has been brought around to the full-speed position.

In putting a compound-wound direct-current motor in circuit it is especially important that the connections are so made that the current will have the proper direction in both of the field windings. A machine designed to be operated with the two fields aiding each other may attain a dangerously high speed if the windings are connected in opposition.

Guaranteed Wiring.

According to *The Electrical Times*, a London electrical journal, the proposal of the Electrical Contractors' Association of Great Britain to initiate a scheme for guaranteeing, up to a certain limit, the work of its members is receiving destructive criticism from within the Association. The *Times* goes on to say:

"Falconar, Cross & Company, one of the best known electrical firms in Newcastle, claim that in objecting to the scheme they are expressing the opinion of a large majority of North-country contractors. They consider that the scheme will benefit only the 'cheap-jack contractor or the cheap-jack buyer,' whose personal guarantee is worthless and who is precisely the stamp of man that needs to be suppressed in the interests of the reputable firms. And further they offer the opinion that the adoption of a guarantee scheme would drive many of the best firms out of the Association. The criticism, it will be seen, is based upon the assumption that the Electrical Contractors' Association contains or is open to members of the cheap-jack variety, and on that point we cannot pretend to the first-hand and inner knowledge which Falconar, Cross & Company are in a position to possess. But it surely is a concomitant of any guarantee scheme that there shall be a searching inquisition into the standing and competency of those who are to benefit by it. Otherwise the members of good repute will simply be bled for the misdeeds of scallywags who are as much out of place in the Association as goats amongst sheep.

"We cannot think that the central board has allowed this danger to escape its notice. If it be a fact that there are goats within the sheep-fold then they must be got rid of, even if it involves the reconstitution of the Association. The whole success of the guarantee scheme depends upon the rarity with which legitimate claims can be made upon it. Its material effect should be insignificant as compared with its moral effect in proclaiming to the public that the installation contractor is so trustworthy that his fellow-contractors are willing to guarantee his work. There is another reason for making membership of the Electrical Contractors' Association a certificate of character. The Institution of Electrical Engineers has asked the Association to co-operate in raising the status of wiremen by means of certificates given after examination. Now, an examining body must be above reproach, it must be an essential preliminary that their certificate shall be regarded by the wireman as an honor and as conclusive evidence of his skill as a craftsman. Therefore the status of the masters must be established beyond cavil or dispute before an effective step can be taken to raise the status of the men. The good master makes the good man."

Convenient Way to Mark Tools.

It is an excellent plan always for the electrician to put his name or some identifying mark on every new tool as soon as he gets it, and put it on so it will stay—assuming, of course, that the tool is his own. An excellent way to mark metal tools is described in the following few lines. Take two parts of copper sulphate and one part of table salt and dissolve in about an ounce of water. Cover the metal to be marked with a thin coat of paraffin, or else take a cake of cheap soap and wet it and rub it over the surface of the metal. Now take a sharp instrument and scratch the name or other marking through to the metal, and then apply the solution. This may be applied with the finger, but care should be taken not to get it into any abrasion in the skin.

The solution will act very quickly, and will leave the tool nicely marked.

George W. Martin.

Device for Stringing Leatherheads on Nails.

In our shop the leatherheads on nails to be used in fastening the knobs

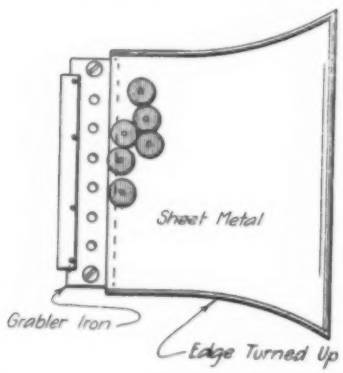


Fig. 1.—View of Hopper with Observer Looking Down Upon It from Above.

in place in knob-and-tube wiring are strung on the nails at odd times by the stock boy, and in this work he uses the device described below. It is a thing that can be easily rigged up in any shop, and if necessary taken out on a big job.

A sort of hopper consisting of an inclined piece of sheet metal, turned up at the sides to keep the nails from falling off is fastened to a bench with nails in the way shown in the accompanying figures. Being tapered at the lower end, this hopper feeds the leatherheads into a space about four inches long. The lower edge of the hopper rests on a piece of perforated grabbler iron which has a strip of plain one-eighth by one-half-inch strap iron riveted along the side furthest from the hopper, the function of the strap iron being to stop the descending leatherheads at the right place for nails to be driven through them and through the holes in the grabbler iron mentioned. Thus the leatherhead can be driven as far on the nail as is desired, and the jarring of the hopper caused by the driving keeps bringing others into position. It is only necessary to keep a quantity of these always in the hopper, and the boy can keep himself busy driving the nails through.

The grabbler iron is supported by means of wood screws which pass to the bench through short pieces of iron pipe.

Beside the device there is a funnel through which the nails are finally dropped into a box put there for them.

The use of an appliance like this is far less expensive than having wiremen string the leatherheads as they need them on the job. We have the nails strung by the keg.

E. M. Raetz.

A Convenient Way of Making a Well Known Test.

The accompanying figure illustrates my way of testing armatures on direct-current motors or generators for open circuits and for short-circuited coils.

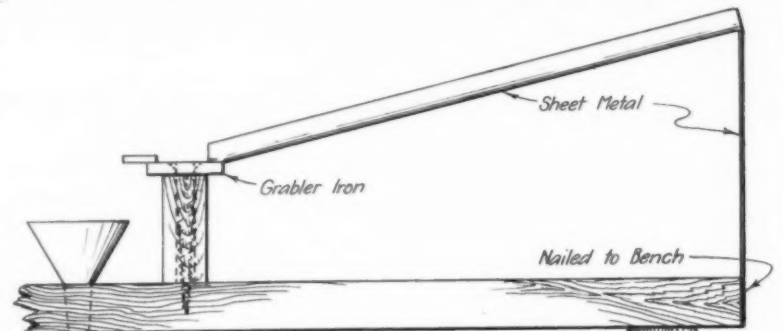
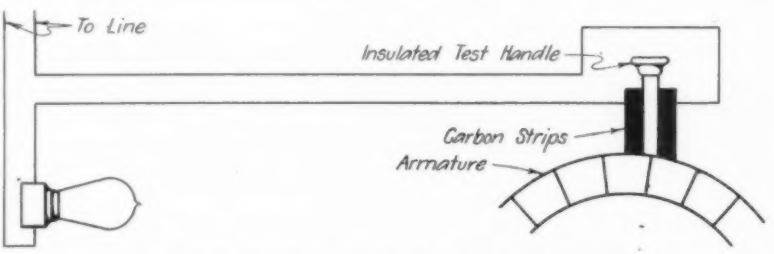


Fig. 2.—End View of Device Complete and Attached to Bench.

To the insulated test handle shown in the figure I attach two pieces of carbon, which the handle holds just far enough apart to make it convenient to touch the adjacent segments with the two carbon contacts at the same time. The test circuit is attached to any convenient source of low-voltage current and an incandescent lamp is employed as a resistance, to keep the test current from being excessive. The lamp also indicates the condition of the coil under the test. The arrangement is a very convenient one.

M. J. Morriarty.



Method of Testing Armatures of Motors or Generators.

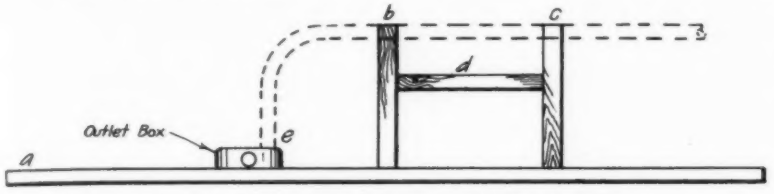
Bending Conduits for Wiring to Ceiling Outlets.

When installing electrical conduits on floor or ceiling joists I find it very convenient to use the simple appliance described below. The use of it makes it possible for me to make all the bends necessary to reach from the top of the joists to the ceiling-outlet boxes before starting to install the pipes and outlet boxes.

I first bend all the ceiling-outlet conduits so that the short leg of the bend is sure to be a little longer than is necessary to reach the outlet. After this bending has all been done, I proceed to use the appliance shown on the following page. This appliance is made of a piece of timber 36 by 12 by 2 inches in dimensions, which is marked *a* in the figure, and of the three additional pieces *b*, *c* and *d*, the last mentioned piece being a brace between *b* and *c*. The pieces marked *b* and *c* are equal in length to the depth of the joists on which the conduits are to be laid, and are nailed

on to *a* in the manner shown. The appliance is completed by nailing an outlet box on the timber *a*.

In using the tool the bent conduits



Method of Measuring Conduits for Ceiling Outlets.

are taken one by one, laid in, notches cut in the upper ends of *b* and *c* so that the end of the short leg of the bend enters the knockout opening in the box. The conduit is then marked at *e* and the end cut off about half an inch below the mark, so as to allow for the threads to hold the locknut and bushing.

As the machined thread on a great deal of the conduit on the market will

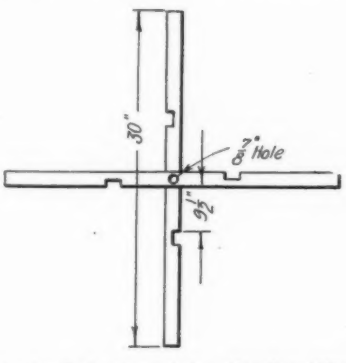


Fig. 1.—End of Reel for Keeping Wires from Tangling.

not hold a locknut, the pipe usually has to be cut off and rethreaded on the job anyway; so the method I use is not objectionable from the standpoint of extra threading or wasted material.

When the ends have been cut the pipe is ready to lay, without the usual procedure of handing up, measuring, bending, etc., that wastes so much time and sometimes causes worry.

John Short.

Keeping Wires from Tangling.

Having seen in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN quite a little recent discussion as to methods of keeping kinks and tangle out of electrical conductors that were being uncoiled, I thought it might not be out of place to mention the way I am handling this matter on a job where I am now employed. On this job we are pulling in some 50,000 feet of duplex wires.

I made three reels for holding the coils of wire. In making a reel, I first took two pieces of three-quarter by two-inch timber 30 inches long, and fastened them together as shown in Fig. 1, having previously bored the

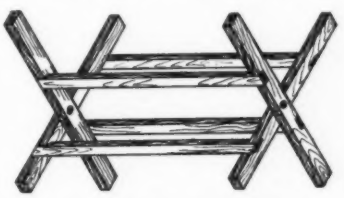


Fig. 2.— Reel Completed.

seven-eighths-inch hole shown and cut the slots indicated. Thus one end of a reel was made. The reel was completed by fastening the two ends together with four pieces of three-quarter by one and a half-inch timber, seven inches long, the finished reel being as shown in Fig. 2, and being arranged so that one end could be readily removed in order that the coil of wire might be slipped on.

In using the reels three of them, each supporting a coil of wire, is

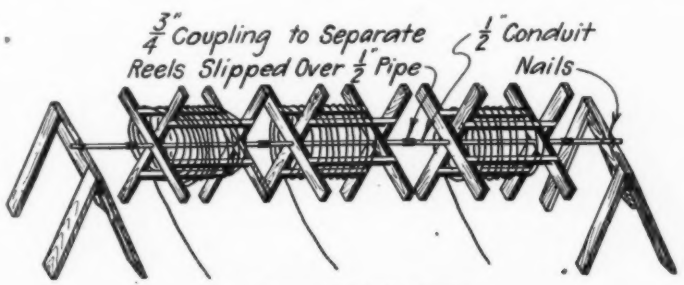


Fig. 3.—Method of Using Reels.

slipped on a half-inch conduit whose ends rest between two nails driven into the tops of wooden horses—see Fig. 3.

By using this arrangement of reels, one can pull in one, two or three duplex wires at a time, as may be desired, without any trouble from tangling or kinking at all.

I made up two sets of these reels —six reels in all—but the pulling in has gone on so rapidly that we have not found it necessary to use more than one set.

O. S. Livergood.

Installing Boxes on Concrete Surface.

Not long ago I undertook a job of exposed-conduit work for motor cir-

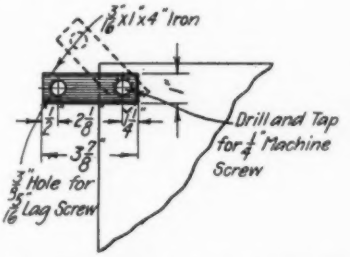


Fig. 1.—Dimensions of Iron for Supporting Corner of Box.

cuits which involved the installation of 50 iron cabinets. These were 24 by 36 by 6 inches in dimensions, and were

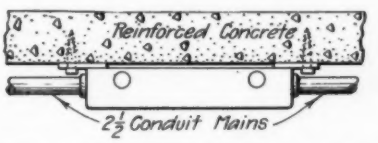


Fig. 2.—Side View of Cabinet in Place on Ceiling.

to be used for the branch fuses. The ceiling of the building was of the reinforced-concrete type, and I encoun-

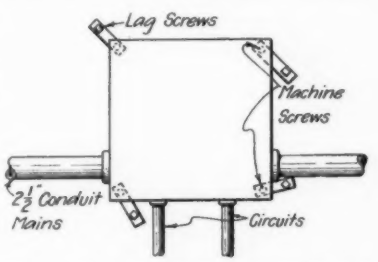


Fig. 3.—View of Cabinet Showing Plan of Support.

tered considerable trouble in installing these cabinets on it. The main difficulty lay in drilling the holes at the proper places to fit the boxes without striking reinforcing rods in the concrete. I finally resorted to the construction illustrated in Figs. 1, 2 and 3,

For each box I cut four pieces of three-sixteenths by one by four-inch iron, and in one end of each piece I drilled a three-eighths-inch hole for a lag screw, while in the other I drilled

and tapped a hole for a quarter-inch machine screw.

I then went ahead and put up the conduits, and installed the boxes in the proper positions by means of temporary bracing from the floor or with any other temporary support that happened to be convenient. Then the holes for lagging on the pieces of iron just described, one at each corner of a cabinet, were drilled in the concrete. If the drill struck a rod in the concrete, it was only necessary to bore at some other point equally distant from the corner of the cabinet, and shift the piece of iron around as shown in Fig. 3.

This made a rigid job, and avoided the waste of time incurred where the workman proceeds by drilling holes in the cabinets to coincide with those he has drilled in the concrete. It is a simple matter to fill holes not used so as not to injure the appearance of the ceiling.

John Dever.

Safety in Overhead-Line Construction.

Commenting upon an article in the *Travelers' Record* concerning accidents to linemen, *Safety Engineering* remarks that the principles that should govern erection of overhead lines that are to be used for combined telephone and power service have received remarkably little attention, until recently, from the point of view of reducing or eliminating accidents among the men who have to work on such lines. There is practically no legislation on the subject in the United States, as yet, but the matter will no doubt be taken up in the near future, in connection with other legislation for reducing accidents.

It is safest to run power lines and telephone wires on separate poles, but, as this involves a considerable extra expense, it can hardly be doubted that in the future, as in the past, conductors of both kinds will often be carried on the same poles. The hazards incident to this arrangement should therefore be clearly understood, and care should be taken to minimize them as far as possible.

It is found that among the line accidents that occur with greatest frequency on transmission systems are (1) those that are due to contact between telephone wires and badly insulated power cables (resulting in high-tension short-circuits over the telephone wires), and (2) those in which telephone linemen come into direct contact with live power wires, and receive shocks which are sometimes immediately fatal in themselves, and which at other times cause the men to fall to the ground so that they receive serious or fatal injuries indirectly.

When both telephone and power lines are carried upon the same poles, the telephone wires are often supported above the power cables; and the first point to be noted is that this common arrangement is distinctly dangerous. Work has to be done frequently on the telephone wires, as new lines are often added, and breaks due to wind, snow, ice, or sleet have to be repaired. Power lines, on the other hand, consist of heavier cables or wires, and they are often separately supported by heavy steel wires. There is little reason why such cables should break, or give trouble in other ways, after they have once been erected. As there is far more work to be done on the telephone wires than on the high-tension transmission cables or wires, it is manifestly better to have the telephone wires at least four feet below the power circuits, so that the men can work upon them without approaching the power circuits near enough to be exposed to danger. When the telephone wires are uppermost, careless linemen who are working upon them often stand on the power cables without taking any special precautions, although they are no doubt aware of the danger of so doing. The insulation of power cables is often unreliable, and is often quickly destroyed by the weather.

When the arrangement of wires and cables herein recommended is not followed, and the telephone lines are run above the power lines, extra care should always be taken by the workmen to avoid injury. In particular, a fiber sleeve, or other similar protection, should be applied to the power cables, to prevent the men from coming in contact with live high-potential wires and the men should never work without rubber gloves.

In all new construction work the telephone wires, if they are not run on separate poles, should at least be carried on separate cross-arms, and be located below the power wires; and a distance of not less than four feet should intervene between the cross-arms carrying the different lines. On lines that are already installed, the telephone wires, if they are run above the power cables, should either be located so that if they break they will fall free of the cables or a guard netting should be provided to catch them. Guard netting should also be provided where different lines cross each other, and all guard nettings should be properly grounded, at short intervals, through ground wires that are in good connection with soil that is permanently damp. A very effective ground can be made by connecting the wires to underground metallic water pipes that are in constant use. The ground wires should be of ample size, and they should be carried down the sides of the poles through pipes or tubes, which should preferably be made of non-conducting material. If iron pipes are used for this purpose, they should themselves be well grounded, and the ground wires that run through them should be protected with a heavy insulating covering.

When power lines and telephone lines are run on the same poles, it is doubly important to faithfully observe the precautions that are required when running power lines alone.

When power lines run beside a road, or along a railroad track or other public or semi-public thoroughfare, they should be carried at such a distance from the line of travel that broken cables will fall at a safe distance from it; and steel guard arms should be attached to the pole arms, in addition, so as to protect the public as far as possible. Where a power line crosses a thoroughfare of any kind, the crossing should be made with as small a deviation as possible from the general direction followed by the main line; but the span in such cases should never exceed 100 to 110 feet, and the spans on the main line, next adjoining the one crossing the roadway or other thoroughfare, should not exceed 100 feet each. When the conditions are such that it is necessary for the cross-over span to deviate from the general direction of the line to a considerable extent, the poles where the change occurs should be strongly guyed in the direction best adapted to resist the unbalanced tension thrown upon them by the abrupt change in the direction of the line.

High-tension wires should always be run so that they cannot be reached from the roofs or windows of buildings that they cross or approach; and such wires, where they pass under a bridge or other similar structure, should be effectively insulated by a suitable weather-proof covering to a greater distance than a man can reach.

The joints of wires that carry high-tension currents should be carefully soldered, in all cases; but they should be made so securely that they are not at all dependent upon the solder for their mechanical strength.

Transformers having a capacity exceeding 15 kilowatts should be mounted on special supports, and should never be attached to the arms of line poles. Smaller transformers may be hung to the poles, but when two of them are to be placed on a single pole they should never be set back to back. If two transformers are to be placed on the same pole, and each has a capacity not greater than five kilowatts, they should be hung on opposite sides of the pole, and near to it; but if the capacity of either of them is greater than five kilowatts, they should be placed one over the other, and should be hung from separate cross-arms.

In all cases, line wires that are temporarily out of service should be cut wherever they communicate with other wires; and if they are permanently out of service they should be entirely removed from the poles, at once.

National Association of Electrical Inspectors.

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H. S. WYNKOOP, vice-president, 13 Park Row, New York, N. Y.
WILLIAM LINCOLN SMITH, secretary and treasurer, Concord, Mass.
JAMES E. COLE, Representative on Electrical Committee of National Fire Protection Association, 11 Wareham Street, Boston, Mass.
J. E. LATTA, assistant secretary, 608 South Dearborn Street, Chicago, Ill.

Executive Committee

EUGENE N. DAVIS, chairman, Brookline, Mass.

Frank R. Daniel, R. P. Strong, Henry A. Knight, C. H. Fletcher
Washington Devereux, James B. McCarthy, James H. Fenton
R. J. Forsyth, C. W. Mitchell, A. W. Hopkins, G. W. Perry
George L. Collison, T. H. Fritts, A. H. Soper
T. W. Bowry, F. G. Hartwell, A. A. Moffitt, Thomas D. McColl

Secretary's Message.

By an error on the part of the Secretary it was stated in this column under the date of September 6 that C. G. Bergendahl, 316 Walnut Street, Philadelphia, had resigned from the Association; this was a mistake, for which the Secretary humbly begs the pardon both of the Association and Mr. Bergendahl.

The address of Executive Committee member Frank R. Daniel will hereafter be 76 West Monroe Street, Chicago.

The address of R. G. Schoedinger is 419 Summit Street, Toledo, O.

The Secretary had hoped that before this, copies of the new Articles of Association would be in the hands of the members for action. They were sent out to the members of the Executive Committee the middle of August, but as yet no reply has been received from fifteen of the members and the Secretary has delayed action in the hope of receiving the approval or comment of these gentlemen, because, of the ten who have replied, five composed the special committee having the revision in charge, and, although ten is a quorum of the Executive Committee, the Secretary has felt that it would be better to await the approval of ten others than the members of this committee. It will be impossible to wait longer, however, if action is to be taken by the Association in time for us to feel any benefit of the new Articles this winter.

The 1913 edition of the National Electrical Code is now in the hands of the various inspectors, and a careful perusal of the same, containing as it does many important changes, should suggest some questions to our members. The Secretary can only plead again for, perhaps not a deluge, but at least a gentle shower of questions, to relieve the severe aridity of his desk.

Installation of Wireless Apparatus.

Question 239. According to Rule 86e, where wireless apparatus is fed directly from a street service, armored cable or conduit wiring is required. Suppose that the street service feeds into a distribution center of, say, three double-branch cutouts and that from one side of one of these the wireless apparatus is fed. What should be required under the above rule?

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Answer 1 (D). Wires should be run from distributing center in metal conduit or armored cable, the remainder of the installation complying with the requirements for transformer and condensers.

Answer 2 (Q). Metal conduit or armored cable would be approved.

Answer 3 (U). Armored cable or conduit is required in this case.

Answer 4 (I). We do not see how this construction could be interpreted to be a case where the wireless outfit was fed directly from a street service; hence it would not seem that under the rule referred to metal-protected wiring could be insisted upon.

Answer 5 (N). I should say that armored cable or conduit would be required unless the wireless was separated from the rest of the system by storage battery, condenser, transformer, or similar device. The mere fact that it was fed as a branch circuit would not modify Rule 86*e*.

Answer 6 (F). Under these conditions we would accept any approved method of wiring.

Answer 7 (B). The feeding from a branch cutout as referred to would not modify the requirements of Rule 86*e*, quoted in question, and the requirements calling for metal conduit or armored cable should be followed.

Answer 8 (E). Under a strict interpretation of the language used in the rule quoted in this question, it would appear that the use of cutouts at a center of distribution, or at any part of an installation, would not change the requirement for the use of metal conduits or armored cable, should the wireless instruments be connected in any way to the street service. This, however, does not apply to a system which has a storage battery as its source of energy, the storage battery having, on its charging side, the energy of street service. In other words, if the wireless apparatus is connected to the street service, either direct or through cutouts which are connected to the lighting system in the building, the lighting system being connected to the street service, the circuit must be installed in metal conduits or armored cables. While the rule does not so state it, it would seem that the use of metal molding, providing it were not concealed, should be permitted.

Answer 9 (O). Rule 86*e* is by no means clearly worded, but I should rule that in the case mentioned the wireless apparatus is fed direct from the street service; on the other hand,

if the apparatus is fed from a special generator driven by a motor supplied from the street service, the feed would not be direct and conduit or cable would not be required.

Answer 10 (P). The line from the service to the distribution center and from the distribution center to the apparatus must be in approved metal conduit or armored cable, and between the distribution center and the apparatus there must be inserted either a one-to-one transformer or a pair of condensers, as conditions may determine.

Answer 11 (J). I should construe the Code rule cited to cover the given case, and to require conduit or armored cable all the way back to the service. In fact, I should ask that the "circuit" for wireless apparatus be run from the service point, and not from a distributing center supplying other power or lighting circuits.

Protection for Induction Motor.

Question 239. Where a three-phase motor is installed with an oil switch or compensator having an overload and low-voltage release is it necessary to install cutouts and fuses also?

Answer 1 (P). Yes; see Rule 23*f*.

Answer 2 (D). If overload and under-voltage releases are in operation during the starting of motor, the use of additional fuses would not be required.

Answer 3 (Q). Cutouts and fuses should be installed unless automatic circuit-breaker disconnecting all wires is used under competent supervision.

Answer 4 (U). If oil switch or compensator having an overload and under-voltage release is of the type that will operate on an overload whether the switch is being held or not, fuses may be omitted—provided, of course, that the switch or compensator completely disconnects the circuit. See Rule 8*c*.

Answer 5 (I). Where a three-phase motor is installed with an oil switch or compensator having automatic overload release which opens all three legs of the circuit when it operates and which is arranged so that the overload release is operative during the time the attendant is closing the circuit, the installation of no other cutout or circuit-interrupting device can be insisted upon. See Rule 8*c*, paragraphs 2, 3 and 4. Fuses would be required, though, if the releasing device were not free to be operated by excessive current while the attendant was attempting to start the machine, or if it did not protect the starting compensator as well as the motor.

Answer 6 (N). If the motor and protective equipment are under expert supervision and the releases are operative at all times whatever is being done, no; in all other cases, yes.

Answer 7 (F). Cutouts and fuses would be required unless the overload device protects all of the wires and is operative during the starting of the motor.

Answer 8 (B). This question does not appear complete, as it does not refer to the location of the motor. If the motor were located in a dynamo room or power station where it was under expert supervision, Rule 8 would permit of fuses being omitted, provided the overload and underload releasing devices referred to in the question were operative during the starting of the motor. In all other locations Rule 23*f* would require approved fuses even though the devices referred to in question were provided.

Answer 9 (E). If the overload-release device is inoperative during the starting of the motor, we would require the use of the cutouts. If, however, the device is operative during the starting of the motor we would not require the cutouts called for in Rule 8*c*.

Answer 10 (O). Fuses may be omitted if the overload protective device is approved for the use intended and is operative during the period of starting (Rule 8*c*, third paragraph), and if it furnishes protection aaginst an overload in any one of the wires leading to the motor (Rule 19*a*, second paragraph), and if the device is installed on a main switchboard, or is otherwise subject to competent supervision (Rule 23*f*).

Answer 11 (J.) We treat this case the same as we would a motor-starting rheostat, under the last paragraph of Rule 8*c*. The Code does not seem specifically to consider this matter under the heading "Auto Starters."

Public Service Commissions

CALIFORNIA.

The Railroad Commission issued a supplemental order granting authority to the Ojai Power Company to assume a note of $2,500 in part payment for the properties of the Nordhoff Water Company.

A decision was rendered granting authority to the Midland Counties Public Service Corporation to purchase the franchises and properties of the Midland Counties Gas & Electric Company, the Paso Robles Water & Electric Company, and the Russel-Robison Water & Electric Company. The Midland Counties Public Service Corporation was also given authority to assume a bonded indebtedness of $821,000 of the underlying companies, and to issue $338,000 of bonds for additions and betterments.

A decision was rendered granting authority to the Pacific Gas & Electric Company to issue $7,000,000 of notes. The authorization enables the company to carry out its plan of financing as previously approved. The proceeds will be devoted largely to extensive hydroelectric development work.

A decision was rendered granting authority to the San Diego Consolidated Gas & Electric Company to issue $25,000 of bonds under a previous authorization.

WEST VIRGINIA.

The Public Service Commission of West Virginia has ruled that hydroelectric companies proposing development of natural water power in rivers of West Virginia must first show to the satisfaction of the Commission, before they are permitted to construct dams, that they are not seeking such permits for speculative or wildcat pur-

poses, and that monopolization of the streams has not been attempted. Rigid rules, prescribing the information and data to be given to the Commission, have been formulated. The companies which have applications pending to construct dams in eight of the West Virginia rivers, under the rules of the Commission will be required not only to show the physical conditions incident to the construction of their mammoth reservoirs, but must give information in detail of their financial resources.

WISCONSIN.

To permit the Clark County Telephone Company to effect a consolidation with the Colby Telephone Company, the Wisconsin Railroad Commission has authorized the former to issue stock to the extent of $27,700.

The application of the Chippewa Valley Railway, Light & Power Company for an increase in the minimum bills of its Spring Valley consumers from 75 cents to one dollar per month has been granted by the Commission. This property was recently acquired by the petitioner.

Managers of all the larger telephone utilities operating in the state and of many of the smaller independent exchanges took counsel with the Commission recently, at the latter's request, over the problems affecting their business, with a view of adopting rules and regulations standardizing telephone service. The tentative rules for service proposed during the meeting of the State Telephone Association held last year have not as yet been adopted and the Commission desired the advice of the telephone men in approving or revising them before their promulgation as official orders. Among the subjects discussed were the speed of answering calls by operators, adequacy of switchboard capacity, maintenance of lines and equipment, the limiting of the number of subscribers to a line, etc. The proposed standards will be similar in purpose to the standards for gas and electric service recently revised and issued by the Commission.

Ohio Electric Light Tax Assessments.

The State Tax Commission of Ohio has completed valuations of all utilities except telephone, telegraph and express companies. The total assessed valuation is nearly $1,000,000,000.

The electric light and power companies of the state are assessed upon a valuation of $36,693,800, an increase over last year of over $6,000,000. Street, suburban and interurban railways are assessed at $143,075,670, an increase of $7,000,000 over last year.

ILLINOIS STATE ELECTRIC ASSOCIATION.

Annual Convention, Quincy, Ill., September 24-25.

An inspection trip to the hydroelectric plant of the Mississippi River Power Company at Keokuk, Iowa, occupied the first day of the annual convention of the Illinois State Electric Association, held September 24 and 25. About 200 members and guests made the trip to Keokuk, leaving Quincy at 9 a. m. Wednesday on the steamer *G. W. Hill*. The party arrived at the plant at about 3 p. m. and the return journey was started at 4 o'clock. After the arrival at Quincy, the manufacturers and supply men were the hosts of the central-station men at a smoker and cabaret, held at the Hotel Quincy.

The business sessions, two in number, were held on Thursday in the assembly room of the Masonic Temple. In opening the first session, J. J. Frey, of Hillsboro, president of the Association, called attention to the fact that this was the fourteenth annual convention of the organization, the first having been held in Springfield, Ill., in 1899. In the early years of the Association's life, the important problems had to deal with lighting—residential, commercial and street lighting. While these questions are still important, they have been overshadowed by questions related to the securing and handling of power business. Mr. Frey called attention to the present tendencies toward centralization of power supply and the syndicating of public-service companies. The entire trend of development is towards greater economies in central-station work.

William J. Norton, of Chicago, presented the opening paper of the convention, entitled, "The Public Utility Commission Law in Illinois." This paper deals analytically with the act which will become effective on January 1, 1914.

Mr. Norton outlined the preliminary actions that were taken in the interest of a regulation bill by the establishment of a committee to study public-service regulation. The present administration drafted a bill which has come to be known as the Administration Bill, which provided that the "home-rule" feature should apply in all cities having 25,000 inhabitants or above. In the original bill drafted and recommended by the committee the home-rule feature was entirely disregarded. This bill was subsequently passed and will become effective on January 1, 1914. In referring to the agitation against the present bill, particularly in Chicago, where the home-rule feature was strongly advocated, Mr. Norton said that this agitation was a display of ignorance both in the fundamental principles of regulation and in the functions of the present bill.

In view of the impending regulation, it is the duty of public-service companies to educate the public in matters of public-utility regulation. The Illinois law, Mr. Norton said, compares favorably with the laws of other states, following closely the California law, with the exception, however, that no provision is made for the regulation of municipal plants. There is no guarantee to utilities in the Illinois law as is given in the indeterminate provisions in the Wisconsin and Indiana laws. Generally speaking, there is not much in the Illinois bill which favors utility companies. The commission has absolute control over all privately owned companies and must approve of all stock and bond issues. Municipalities can construct and operate plants in competition with existing private plants without permission from the Commission.

Mr. Norton explained that inasmuch as the law will be a hard one to administer, it is hoped that Governor Dunne will exercise the greatest care in the selection of the commissioners.

The discussion resolved itself into a series of questions relative to various features of the bill. L. E. Marshall, of Dixon, asked what right of condemnation this law gave to the Commission. George R. Jones, of Chicago, inquired as to the existing commission which has jurisdiction over municipal plants. Theodore Blech, of Waukegan, explained that in Wisconsin, public-utility companies are permitted to apply for highway rights directly to the Commission without regard to property owners. He asked what the Illinois law specifies in this connection. G. L. Spencer, of Dixon, asked what the relation between the new Public-Service Commission and the existing Railroad and Warehouse Commission would be.

Answering these questions, Mr. Norton stated that if the Commission orders extensions or improvements, it has the right to condemn such property as is affected. In answer to Mr. Jones, it was stated that several other states give their commissions the same control over municipal plants as over private plants. The stock and bond clauses in the Illinois law have been copied from New York. The Commission has the right to make a complete valuation before authorizing a bond issue. In answer to Mr. Blech, it was stated that in the matter of highway permits, the Illinois law is similar to that of Wisconsin. Mr. Norton explained that the Railroad and Warehouse Commission would be automatically abolished when the new Commission came into effect.

Albert Scott of Chicago, E. D. Alexander of Dixon, O. C. Macy of Alton, Fred Reimers of Rock Island, E. MacDonald of Lincoln, and L. E. Jacobson

of Dixon, also asked questions relative to details of the Illinois law.

Following this discussion, a paper entitled "Tendencies in Switchboard Design" was presented by Stephen Q. Hayes, Pittsburgh. This paper presented detailed descriptions of modern installations made within the past few years in Illinois plants.

Fred Reimers, of Rock Island, asked how the cost of electrically operated switches compared with that hand-operated switches on small work. Mr. Hayes stated that the cost of operation varies with the size and design of the switch. No definite figures could be given.

At this point, President Frey appointed a Committee on Resolutions and Nominating Committee, the latter composed of John G. Learned, H. J. Pepper and E. H. Walscher.

At the afternoon session, J. W. Buchanan, of Chicago, presented a brief paper on transformers and lightning arresters. The operation of transformers may be classified under the following headings: (1) distributing transformers up to 2,200 volts; (2) high-tension transmission of 33,000 volts and over. The efficiency of transformers depends upon the manner in which they are used as standard efficiencies have been obtained by all manufacturers. It is better practice to limit the number of transformers used on an installation and increase the unit capacity. Mr. Buchanan recommended that companies be generous in the use of copper, and care should be taken in loading transformers. The ratio of the load to transformer capacity varies in different districts and it is advisable to use a maximum-demand meter for learning if the transformer is properly loaded.

Relative to the 33,000-volt transformers, Mr. Buchanan said that open delta operation on distributing systems has certain advantages up to 10,000 volts. But over this voltage, it is extremely bad practice as disturbances on the system will usually destroy the transformers. The Y-connection on both sides of a bank of transformers is also to be discouraged. On the other hand, delta connection on the high-tension sides is meeting with favor, for if a surge strikes the delta side, there are two paths for it to traverse.

As to voltages, Mr. Buchanan said that 8,000 is becoming popular. 2,200 is the standard voltage with practically all companies, and he recommended that multiples of this figure be used instead of selecting arbitrary voltages.

Speaking of lightning protection, Mr. Buchanan called attention to two types of lightning arresters at present available: (1) multi-gap; and (2) aluminum cell. The multi-gap is suitable where the investment in the lines or equipment to be protected is not sufficiently large to warrant the use of aluminum-cell arresters. Mr. Buchanan recommended that lightning arresters be installed at the place where the protection is desired. He said that the manufacturers are endeavoring to produce a cheap arrester that can be placed at every transformer. Aluminum-cell arresters must be charged daily which increases their cost and therefore they cannot be used except where the investment justifies the expense of such protection. They should, however, be installed at every generating station.

Following this, Albert S. Scott, of Chicago, presented a paper entitled "Freight Bill Accounting." The author explained that the continual round of trouble with railroads experienced by central stations has led to the preparation of a specific accounting system applicable for this work which has been tried out by the Public Service Company of Northern Illinois for nine months with excellent results. The plan, however, applies principally to companies operating over an extensive territory, making its disbursements from a central office. The plan was set forth in detail with full instructions and facsimiles of forms and records used.

Fred Benson, of Chicago, then spoke briefly on the subject of "Proper Lamp for the Circuit." With the old tungsten lamps first produced, the manufacturers advised that lamps rated two volts above the voltage of the line be used. The improvements made and being made in tungsten-filament lamps has made this practice obsolete and central stations now lose money by using lamps of higher voltage than the line voltage because of the decreased consumption; and also, the efficiency of the lamp is noticeably decreased. Mr. Benson said that manufacturers would shortly adopt a single-voltage label for all lamps.

As to the improvements that may be looked forward to, Mr. Benson said that the present tendency is to reduce the size of the bulb as filaments can now be made of much shorter length than previously. The concentrated filament will eventually be used in all standard lamps, which will further reduce the size of the bulb. Referring to the new "nitrogen-gas" lamp, Mr. Benson said that this would be suitable for series street lighting only, and will not in any way complicate the present lighting situation or decrease revenues of the central stations, in spite of its efficiency of 0.5 watt per candle.

Mr. Benson referred to the five-lamp carton which the manufacturing companies are now making and stated that central stations should encourage the use of them, as customers will almost always have an extra lamp available to replace one burned out if they are purchased in lots of five. He referred briefly to a new practice which the General Electric Company has inaugurated of employing lady solicitors for residential campaigns; also to the training school at Harrison, N. J., for central-station employees.

C. W. King, of Lewiston, in the discussion, stated that when carbon lamps were used, the labels specified the candlepower. Since tungsten lamps have been in use, customers have familiarized themselves with wattages as indications of the size of lamps. In view of this, he thought it advisable for the new lamps to have the candlepower rating given instead of the wattage, on account of their high efficiency.

S. B. Cushing, of Chicago, then presented a paper entitled "Street Lighting." This paper points out that uniformity of rates inspires confidence of the public in central stations. Incandescent lamps are being widely used for street lighting, and in many cases are displacing arc lamps. Contracts should be made, if possible, on a ten-year basis, and street lighting should be made to stand its share of the total expense of the company. It is recommended that companies abandon the use of the moonlight schedule and have contracts specify lighting from dusk to dawn, or from dusk to midnight, in some instances. The 60-candlepower tungsten lamp was recommended for small town lighting, no clusters over three lamps being used. Rebates for outages should not be made unless lamps are out for more than two successive nights. Mr. Cushing called attention to the various "invisible" expenses which must be considered in figuring the cost of street lighting, one of the important items being the cost of collecting bills. The cost of obtaining right of way and cutting trees, etc., also must be considered. The cost of energy is only about 15 per cent of the total cost of furnishing street-lighting service. Mr. Cushing presented detailed figures on the costs of furnishing street lighting to a number of small towns.

Following this paper, the executive session was held, at which the report of the secretary and treasurer was read, and resolutions of thanks passed. The report of the Nominating Committee was presented, and the following officers were elected for the ensuing year:

President, E. MacDonald, Lincoln.

First vice-president, Fred Reimers, Rock Island.

Second vice-president, E. H. Negley, Canton.

Third vice-president, R. H. Abbott, Petersburg.

Fourth vice-president, H. O. Channon, Quincy.

Treasurer, C. W. King, Lewiston.

Secretary, H. E. Chubbuck, Peoria.

Assistant Secretary, C. A. Willoughby.

The new Executive Committee is composed of: W. B. McKinley, F. J. Baker, E. W. Smith, J. J. Frey, and R. S. Wallace.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS.

The Seventh Annual Convention Held at New York City, September 22 to 27.

The seventh annual convention of the Association of Iron and Steel Electrical Engineers was held at the Hotel McAlpin, New York City, September 22 to 27. Business sessions were held each morning and afternoon with the exception of Tuesday afternoon and all day Saturday, which were devoted to visits to plants and other places of interest, guides being furnished where required.

The first session for the reading of papers was held on Monday afternoon when the papers entitled "The Selection and Operation of Carbon Brushes" by W. P. Poynton, and "Alternating-Current and Direct-Current Magnetic Control," by M. A. Whiting, were read.

The Selection and Operation of Carbon Brushes.

In this paper Mr. Poynton lays emphasis on the necessity of careful selection of carbon brushes to meet steel-mill conditions. In the general selection of carbon brushes the following points are of great importance.

(1) Brushes should be of close grain and mechanically strong.

(2) Brushes should be perfectly smooth in finish of both carbon and copper plating, and all brushes of a given size should be exactly alike in all dimensions.

(3) Brushes should operate satisfactorily with light spring tension.

(4) Brushes should be dry, i. e., free of any compound such as paraffine wax, oil or other grease.

(5) Brushes should be non-abrasive and should not require any lubrication of any kind on commutator to prevent heating or cutting of same.

(6) Brushes should be absolutely uniform electrically, free from cracks or flaws of any kind, and should not expand with change in temperature.

Special attention must be given to the matter of the adjustment of the brush-holder spring tension. Inattention to this detail results in a great deal of commutator and brush trouble, which in many instances are attributed to other causes. He suggests the use by the motor inspector of a spring balance with the scale calibrated in one-quarter-pound increments. The proper use of a balance of this kind will do much to provide a uniform tension on brush holders. Mr. Poynton is of the opinion that the pig-tail type of brush with the pig-tail made an integral part of the brush is of considerable advantage in eliminating brush trouble. He shows a number of cases increasing considerably the first cost of carbon brushes in order that the highest quality might be secured resulted in an ultimate saving many times in excess of that involved in the first cost.

On Tuesday morning the meeting was opened with the reading of a paper entitled "Direct-Current Turbogenerators," by H. A. Rapelye.

This paper reviews the elements entering into the design of the direct-current turbine generating unit. Direct-current generators, without the limitations of frequency, may operate at any speed up to that fixed as the highest by other factors of design. In general, however, this high speed for any size of generator is rather low from the turbine designer's viewpoint. The author shows a number of curves which illustrate the relations between machines of 1,800 and 3,600 revolutions per minute. He offers several solutions of the problem of using the direct-current generator and the standard alternating-current generator, and a motor-generator set or rotary converter. He describes the use of gearing, with high pitch-line speeds; the construction of the pinion shaft journals and particularly the floating frame for the pinion shaft were given special consideration.

Standardization.

This paper elicited very little discussion and the balance of the morning was devoted to a discussion of a report on the part of F. D. Egan, chairman of the Standardization Committee. It was Mr. Egan's purpose at this meeting to get the opinions of manufacturers and mill men as far as possible as to what matters should be considered for standardization, and some idea as to the methods to be adopted. The subject was discussed by H. F. Stratton, M. A. Whiting and C. T. Henderson. Mr. Stratton called attention to the continuous development and improvement that was going on in securing high-speed production in the mill industry. He suggested that the personnel of the Committee on Standardization should be one that would allow for the widest possible latitude in reasonable and fair competition upon the part of all manufacturers. He thought it was entirely out of place for associate members, that is, manufacturers, to have a place on the Standardization Committee. He felt certain that all of the manufacturers would be glad to cooperate with the mill men's committee and lay before this committee all the information they had at their disposal. In drawing up any standard specifications the specification should not lead to the disadvantage of any particular character of apparatus which has been found competent and capable of performing the service which the specification is intended to cover. To his mind standardization should be with regard to good performance and not with regard to limiting the physical design of apparatus. Mr. Henderson seconded the views of Mr. Stratton with regard to the personnel of the Standardization Committee. To his mind the real thing to be accomplished in standardization was to secure a gauge of performance. It would be unfortunate for the committee to make any attempt to specify physical details of apparatus. It would also be entirely unwarranted to establish certain specifications for interchangeability, particularly in view of the difference of the state of development of alternating-current and direct-current controlling apparatus.

The first paper on Wednesday morning was entitled "Recent Development in Switching Devices for Power Circuits," by T. G. Mahoney.

This paper takes up in detail the development which has been brought about in the design and manufacture of carbon circuit-breakers and oil circuit-breakers. It deals with the principles of construction and the theory underlying the operation of the various types of circuit-breaker.

Lifting Magnets.

The next paper, by B. E. Fernow, Jr., entitled "Design and Use of Lifting Magnets," in the absence of the author, was read by C. T. Henderson. The particular point brought out in this paper was the comparison of the circular and the bipolar types of lifting magnets. According to the author, the circular magnet shows considerable advantage in efficiency in the handling of pig iron and scrap. In a particular test a considerable saving in current was shown on the part of the bipolar magnet, the consumption being only 30 amperes for the bipolar, as against 70 for the circular. The author considers that this might in some cases be sufficient to make the use of the bipolar desirable in spite of its lower lifting capacity. He is of the opinion, however, that in general it cannot be offered as a competitor to the circular type. He describes the construction of the circular magnet and the theory of operation. The author also gives figures showing a very great saving in steel-mill operation through the use of lifting magnet.

In discussing this paper, H. F. Stratton stated that the last word had not been said with respect to the bipolar magnet. The tests to which the author referred showed the bipolar magnet at a disadvantage with regard to lifting pig and scrap, but it was quite likely that developments which were now under way would eliminate even this disadvantage.

E. H. Wentz, of the National Tube Company, stated that he was using 15 lifting magnets, several of which were home made. There had been very little repairs necessary, except for the refurnishing of bolts and some new rings. There had been some trouble with the stud where the flexible cable was fastened to the ring. This, however, was easily repaired. He found that by allowing the flexible cable to hang from the trolley suspension arm on a locomotive crane, considerable damage was eliminated. The use of armored cable had not been satisfactory because it does not loop easily. In handling pipe, Mr. Wentz was of the opinion that the lifting magnet was not as efficient as the use of chain slings or cables. That is, they could get a greater capacity with the older methods of handling.

In reply to a question, Mr. Henderson stated that bare aluminum wire for the magnet coils had been used to some extent. In some cases results had been excellent, but there had not been enough experience to determine exactly what would happen, and it was not possible at this time to guarantee the product.

Mr. Stratton also discussed the matter of the use of bare aluminum wire. Coils had been built depending entirely on the aluminum oxide for insulation between adjacent coils with part insulation between layers. It did not look as if it was feasible to depend entirely upon the oxide insulation, however. He mentioned an instance of aluminum coil of large cross-section under a temperature test of 350 degrees centigrade for over a week. This was then completely immersed in water and put back in service at full voltage. The laboratory test showed practically no change in resistance. Of 30 coils wound with bare aluminum wire only one breakdown had been recorded, and this was due to a mechanical oversight or weakness in the design and could not be used to the discredit of the bare aluminum wire. Mr. Stratton also pointed out the advisability of careful investigation of magnets for stock handling, and their very interesting use in foundry work. Magnets were being used inside and were meeting with considerable popularity due to their ability to decrease the cost and increase production.

O. R. Jones, of the Western Conduit Company, said that they protected their flexible cable with armored conduit and had no trouble in handling ingots and butts at a cherry red heat.

C. W. Parkhurst said that he had used magnets of the circular type from 18-inch to 60-inch for all kinds of service, for open hearths, in the plate mill, for the skull cracker and blooms. Most of any trouble they had was due to accidents to the flexible cable and this was caused by careless handling in practically every case. He called attention to the uselessness of the ordinary eye-bolt furnished on electromagnets and endorsed the use of cast lugs for chain suspension. Where these lugs are broken off they may easily be patched with the electric arc. His company had found that the cost of operating the electromagnets was so low that they positively could not be without them in increasing their efficiency of production.

E. Friedlaender described a method of attaching the rubber-covered cable, utilizing a wooden drum with a speed of about 10 per cent less than the drop of the magnet. The cable is wound to the right and left on the drum so as not to run one wire upon the other convolution and this scheme had eliminated breakage of the cable.

G. W. Richardson, of the Pencoyd Iron Works, suggested the use of a three-pole magnet using one pole of one polarity and the two outer poles of the opposite polarity. He uses a lifting magnet to handle a 20,000-pound ball and had not any difficulty in releasing the magnet, nor was there any jar on the crane.

F. R. Fishback read a communication from A. C. Eastwood, of the Electric Controller & Manufacturing Company, relating to lifting magnets. Mr. Eastwood referred to a considerable bibliography on the lifting magnets as set forth in the records of the United States Patent Office. He called attention to the humanitarian influence of the electromagnet in removing hundreds of men from dangerous occupations. He had been making careful figures with respect to the efficiency of the bipolar magnet and had found the performance entirely satisfactory. Careful investigation among steel-mill men revealed no prejudice on account of its form and insofar as its ability to meet the torsional strains, all that is required is to make the magnet as a whole strong enough to withstand any strain.

James Farrington described a test of magnets for stock-house work on two cranes. Both the bipolar and round type of equal capacity were involved. The magnets were interchanged, but the same crane men were employed so as to make the conditions as even as possible. In general the bipolar magnet ran about 15 per cent short in efficiency compared with the circular magnet on ingots, round slabs and pig iron. He also described the use of lifting magnets on asphaltum pipe. His experience proved that a magnet could not handle as great a tonnage as the old method of chain slings. In order to avoid damage to the conductors he was using duplex cable with an asbestos sleeve six feet long to protect the cable from the hot slabs.

Mr. Friedlaender stated that he had found the bipolar magnet very satisfactory in service. He described a skull-cracker with extension ribs which had shown a great advantage in lifting a 30,000-pound ball. These, however, would not pick up small scrap owing to the extended ribs. Mr. Friedlaender pointed out the great advantage in taking down and assembling the bipolar magnet owing to its simple construction. He called attention to the great advantage in production that had come about in the development of the lifting magnet and mentioned two mills that had been able to do away with the work of 80 men in two turns through the installation of lifting magnets.

W. F. Detwiler called attention to an apparent critical temperature of about 1,500 degrees Fahrenheit where the magnet lifted to the best advantage. Between 1,400 and 1,450 degrees Fahrenheit, the iron and steel appear to become non-magnetic and there appears to be another non-magnetic period at about 1,600 degrees.

Illumination.

At the Wednesday afternoon session a paper entitled "The Mercury-Vapor Quartz Lamp," by W. A. D. Evans, was read. This paper describes in detail the design of the mercury-vapor quartz lamp, and the theory of operation. It also goes into a generalization with respect to the color value and light characteristics of this lamp and explains many applications into which the lamp is making its way.

This paper was discussed by J. H. Reniers, W. C. Snyder and Fred H. Woodhull. The general consensus of opinion was to the effect that if the lamps were placed sufficiently high, say about 38 feet high upon 80-foot centers, that an efficient and economical system of illumination, with excellent distribution, was secured.

Electric Drive for Main Rolls.

On Thursday morning the first paper was read by Brent Wiley, entitled "Present Status of Electric Drive for Main Rolls."

The principal feature of this paper was a list of electrically operated reversing mills in Europe, the United States and Canada. There was also considerable data given with respect to the character and the capacity of the apparatus in service. A chapter devoted to features of large rolling-mill motors was of particular interest. This described in detail the construction of these machines. The method of connected driving units in the mill was given consideration, as well as the various means and methods for establishing proper control. The author

sums up the advantages of motor drive and discusses the advantage of central-station power as against an isolated plant. He also gives certain comparative figures respecting the efficiency of motor drive on the main rolls for various installations, and compares the cost of the motor installation with the steam-engine drive. This works out with great advantage to the motor equipment.

This paper was followed by a paper entitled "Questions on Motor Drive for Main Rolls," by E. Friedlaender.

Mr. Friedlaender described a number of questions that had been submitted to the mill men in order to bring out certain questions with regard to the efficiency and application of the motor drive on main rolls. The general result of the questions and the opinion of the author is to the effect that the motor drive is considerably more efficient insofar as cost of operation and greater production is concerned, and that it also introduces elements of reliability not possible with the steam drive.

In discussing this paper R. Tschentscher raised the question as to whether there was not some doubt as to the similarity of the efficiency of the motor drive for large and small plants. For the large plant there could hardly be any question as to the economy of motor drive. He suggested, however, the exercise of caution in accepting the conditions outright for the smaller plants. He felt that in some cases a shut-down due to a breakdown of the motor is more disastrous than that which occurs with the engine plant. He also suggested the use of graphic recording instruments in securing proper information with regard to the power consumption.

B. G. Beck called attention to the necessity of making a careful study of mill requirements, suggesting that by proper lubrication and the accurate adjustment of the hot and cold rolls that a great reduction in power demand might be secured. So far as his experience went it had been demonstrated that with the motor drive the tonnage had far exceeded the capacity that had been anticipated. The ability of the motor to take the peaks in quick succession was one of the greatest of its advantages.

Mr. Friedlaender produced figures which showed the advantage of using the motor drive. He also discussed the question of buying central-station power compared with developing power from an isolated plant. He was of the opinion that where current could be bought at from one cent to one and one-quarter cents per kilowatt-hour it would pay to shut down the private plant. The paper was also discussed by W. D. Stevenson, F. B. Crosby, J. H. Wilson, A. G. Ahrens and J. M. Petty.

The Mazda Lamp in Mill Illuminations.

The first paper of Thursday afternoon was entitled "A Progress Report on Illumination," by Ward Harrison and H. H. Magdsick. This paper showed in a very interesting fashion the great increase in the use of the Mazda lamp in mill installations. It showed graphically that there had been a considerable falling off in the carbon arc, the magnetite arc, flame arc, mercury-vapor and carbon incandescent lamp. The carbon incandescent lamp, however, is not going out of service as rapidly as might be expected. As a concrete example in the loss of economy through the use of these carbon incandescent lamps, the authors figure that if the 27 plants included in their summary are considered typical of the 76 plants represented in the Association's membership, that there is still installed a total of about 24,000 kilowatts in carbon arc and carbon incandescent lamps. On the basis of the average hours used per year as recorded for the total lighting consumption, and at an energy rate of one and one-half cents per kilowatt hour, the total cost of energy and maintenance of these lamps is over $1,500,000 per year. At the most conservative estimate the authors state that almost two-thirds of this is entirely wasted in view of the higher efficiency of the modern equipment with which it might be replaced. In other words, a failure to eliminate these obsolete units is costing over $1,000,000 annually.

This paper was discussed by B. Gillson, J. H. Wilson, J. C. Reid, R. S. Ireman and Mr. Friedlaender.

The balance of Thursday afternoon was devoted to the reading of papers entitled "Variable Speed for Main Rolls of Steel Mills," by K. A. Pauly, and "Notes on the Present Status of Electric Furnaces," by Wilfred Sykes.

Banquet of the Association of Iron and Steel Electrical Engineers, Held in New York, September 24.

On Friday a paper entitled "Herringbone Gears for Steel Mills," was read by P. C. Day. This paper describes the operating characteristics of the hobbed cut steel gear.

The balance of the day was devoted to a discussion of standardization methods. The Standardization Committee is to make requests of the members for data as to the subjects to be considered and the methods followed, and this report is to be presented at the next meeting.

At the banquet which was held on Wednesday evening addresses were made by R. W. Campbell, the Hon. James T. McCleary, E. J. G. Grace and J. H. Burnett. The toastmaster was John K. Tener, Governor of Pennsylvania.

Officers were elected for the ensuing year as follows:

President, E. W. Friedlaender.

First Vice-President, O. R. Jones.

Second Vice-President, R. Tschentscher.

Secretary, W. T. Snyder.

Treasurer, James Barrett.

Illuminating Engineering Society.

Report of the Seventh Annual Convention, Pittsburgh, Pa., September 22-25.

The seventh annual convention of the Illuminating Engineering Society was held in Pittsburgh, Pa., September 22 to 25, with the Hotel Schenley as headquarters. The convention was a most interesting one and carried evidence of the increasing importance of this society with each succeeding year. The registration at this convention was over 450 and the attendance was probably in the neighborhood of 500. Of these, 180 were members. The prize for the largest attendance from any of the sections, account being taken of distance from Pittsburgh, was awarded to the New York Section. The prize consisted of an ornamental table lamp.

The convention was called to order at 10 o'clock on Monday morning by the chairman of the Convention Committee, C. A. Littlefield. An address of welcome was made by the president of the Pittsburgh Chamber of Commerce, William H. Stevenson, to which Norman Macbeth made an appropriate response.

George A. Hoadley then presented, on behalf of the Philadelphia Section, an historic gavel to the Society. A description of this gavel will be found in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of September 13, page 537.

The presidential address was then delivered by Preston S. Millar.

Presidential Address.

This address was a résumé of the present status of the art of lighting. To secure information regarding present practice, questions were prepared and sent to central stations, gas companies, engineers, railway companies, manufacturers and others to the extent of about 1,750; about 20 per cent of which replied. From these answers and the general information available a record was prepared showing general conditions now in vogue. Illumination was discussed from the standpoint of intensity, direction, diffusion, color, steadiness, contrast, congruity, hygiene and safety, and cost. The general tendency is toward higher intensities, while increased attention is being given to direction and diffusion of the light. A table is given showing the typical intensities of illumination in various applications. In one-half to two-thirds of the installations reported upon, a certain amount of diffusion has been obtained by means of diffusing globes, depolishing the inner surfaces of reflectors, or by indirect lighting. The necessity for steadiness is well recognized. Glare is discussed under the heading of contrast and the necessity for avoiding it is becoming generally recognized, exposed light sources being gradually done away with. The relation of light to hygiene and sanitation is discussed. Cost is considered under three elements: equipment, maintenance and operation. It is shown that the cost of lighting is a very small percentage of the total operating costs in buildings of every type.

The report of the Committee on the Organization of the International Committee on Illumination was presented by George S. Barrows, as none of the members of this committee were present. This report reviewed the movement started about two years ago for the formation of an international body to consider questions pertaining to illumination. A meeting was held on July 18 for the organization of a United States National Committee and was attended by delegates from the American Gas Institute, the American Institute of Electrical Engineers, the American Physical Society and the Illuminating Engineering Society. E. P. Hyde was elected president and C. H. Sharp secretary of the United States National Committee. A meeting to reorganize the International Photometric Commission was held in Berlin, August 27-30, ten nations being represented by 44 delegates. The name of the Commission was changed to International Illumination Commission and statutes for its conduct were adopted. These provide for the formation of national committees by the national technical societies interested in lighting. The business of the Commission is to be transacted by these committees, acting through the honorary secretary of the Commission and through delegates sent to the general meetings, which are to be held every three years, and through standing committees. The next meeting of the Commission is to be held in Paris in 1916.

The report of the Committee on Progress was then presented by the chairman, F. N. Morton.

The Committee on Progress has made a very thorough examination of the literature of the subject during the past year and has compiled a summary of important developments, which is very comprehensive. These developments are discussed under the headings; incandescent electric lamps, electric arc lamps, vacuum-tube lamps, gas lamps and appurtenances, acetylene, sundry systems, luminous animals, photometry, ophthalmology, indirect lighting, street lighting, fixtures, globes and reflectors, physics, legislation, photography and illumination measurements.

This report was discussed by George A. Hoadley, V. R. Lansingh and P. S. Millar.

The afternoon session opened with a presentation by Ward Harrison of a paper by himself and E. J. Edwards entitled "Recent Improvements in Incandescent-Lamp Manufacture."

Improvements in Incandescent-Lamp Manufacture.

The strength of tungsten filament has increased more than 300 per cent since 1908, and the strength of drawn wire has increased 40 per cent since 1911. Greater strength permits operation at increased efficiencies at no decrease in total life. The use of chemical in the bulbs has reduced the blacking of lamps to a marked degree and it is therefore possible to operate them at efficiencies correct from the standpoint of total life with no shortening of the useful life. The performance of chemical lamps is not satisfactory when operated at low efficiencies. Use of chemical has made possible a substantial reduction in bulb size for several lamps. Decreased bulb size reduces manufacturing costs and broadens the application of the lamp. During the past year lamp dimensions have been standardized in every particular. The average deviation from the standard is less than one-fourth that of a year ago. The introduction of the coiled filament makes possible many new forms of lamps which heretofore could not be manufactured. The strength of the filaments is increased by this process and the candlepower maintenance is not affected. The operation of helical filament lamps at high efficiencies and their use in small bulbs are the causes of their comparatively low life ratings. The new tubular lamp and the focus-type lamp have many applications, such as showcase lighting, use in projectors, stereopticons and the like.

The discussion was opened by L. J. Lewinson, who presented data showing the improvement in watts per candle of lamps manufactured between 1911 and 1913, and also the improvement in life. The latter can now be taken as 2,500 hours for a 250-watt lamp operated at one watt per candle.

V. R. Lansingh pointed out the usefulness of the helical filament with reflectors having specular reflection. The size of the source was formerly a difficulty. This development will have considerable influence upon the design of prismatic glassware.

L. C. Porter spoke of some of the applications of the new type of lamp having a helical filament. This will replace the arc lamp for many kinds of lantern and projector work, as in theaters, where effects require dimming, are hard to secure with arc lamps. The fire risk will also be reduced in many cases, as in moving-picture machines. It will prove useful in signal work and perhaps also for locomotive headlights, legislation on which subject is being adopted in a large number of states. Incandescent lamps will provide an intermediate in-

tensity for these headlights, being lower than an arc lamp and higher than an oil lamp. There is much opposition to the arc lamp for this purpose, especially in cases of double track and block signals.

H. E. Ives spoke of its use in photometric research. It will be possible to get nearer to the source with this lamp than with the old style of filaments. This permits much higher intensities of illumination upon the photometer screen.

Harry S. Hower said that the new lamp had been tried in connection with lighthouse lenses, and will no doubt replace other illuminants for this use in many cases.

H. S. Dunning called attention to the fact that the white deposits often noticed in bulbs did not necessarily lessen the light flux and lamps should not be scrapped on this account. Frequently a lamp which has shown depreciation in candlepower will at some point in its life show a sudden increase.

Harold Calvert, W. F. Little, R. E. Myers, J. R. Cravath, G. H. Stickney and M. G. Lloyd also joined in the discussion of this paper. In closing, Mr. Harrison stated that the useful life for Mazda lamps was reached when they had dropped to from 65 to 72 per cent of the initial candlepower. This smashing point is independent of the cost of lamps and renewals, provided the lamp is operated at the proper efficiency. The watts per candle should be higher, the higher the cost of renewals in relation to the cost of energy. There has been no noticeable effect upon the temperature of the filaments due to the coiling and the life of such filaments is the same as straight filaments operated at the same efficiency.

The next paper to be presented was by T. H. Amrine, entitled "The Cooling Effect of Leading-in Wires Upon the Filaments of Lamps of the Street Series Type."

The Cooling Effect of Leading-In Wires.

This study of the cooling effect of the leads was undertaken as part of a general investigation into the effect that dimensions and material of lead wires and supports have upon incandescent-lamp design. The method used was to calculate the average per cent of normal candlepower and average per cent of normal wattage over the cooled portion of the filament by means of measurements made upon two sets of lamps of exactly the same construction except having different filament lengths. The variation of the cooling effect with lead material, lead diameter, lead length, filament diameter and filament material was determined. The cooling effect of any lead upon any filament was shown to be dependent mainly upon (1) the resistance to heat flow presented by the leads and the cooled portion of the filament, (2) the diameter of the filament and (3) the temperature of the uncooled portion of the filament. For lamps having lead and filament dimensions encountered in street series lamps the cooling effect decreases with increase of lead length, with decrease in lead diameter and with increase in thermal resistance of the material of the lead.

D. McFarlan Moore pointed out that the cooling effect amounted to about eight per cent of the total wattage of an incandescent lamp and compared this with the vapor-tube lamp.

E. J. Edwards projected upon the screen the image of filaments carrying current to demonstrate the effect of resistance upon the energy loss.

M. Luckiesh explained the lesser cooling effect at high filament temperatures by pointing out that the heat lost by conductivity, through the filament was proportional to the temperature; whereas, the luminous intensity increased as some high power of the temperature.

The next paper was by S. G. Hibben and was entitled "Modern Practice in Street-Railway Illumination."

Street-Railway Illumination.

Up to the present time street car lighting has been done inefficiently, with bare carbon-filament lamps. Recently there have been four standard tungsten lamps placed on the market, which in conjunction with proper reflectors have enabled the energy cost for lighting to be cut in half, at the same time allowing an increase in the usable light of more than 80 per cent. Special fixtures are available for supporting the shades, and selector switches may be employed to insure continuous lighting service of series lamps. More steady illumination is secured by the new system of lighting, under the adverse conditions of voltage fluctuations, and the glare that exists at present in the majority of electrically lighted street cars is done away with through the use of shades. The scientific, economical lighting of street cars is a field that is full of interesting possibilities, and which is now being very rapidly developed.

L. C. Porter said that several years ago there was a question as to whether tungsten lamps would stand street car service. It was shown at that time, however, that they gave a good life on battleships upon which target practice took place, and also upon ferry boats, and had consequently been tried on the Bay State Railways. He considered it preferable to use 56-watt lamps on two circuits rather than 94-watt lamps on one. Shadows were less objectionable where there were more lamps. These lamps were tried for one year, reflectors being used with them and the equipment has since been generally adopted.

E. B. Rowe said that the choice of 94 or 56-watt lamps depends upon the local conditions. Since a city street is never totally dark, there is less objection to having all the lamps go out in the car than upon an interurban road. He favored the use of a spare lamp and a selector switch. The change of brightness with voltage is very marked with carbon lamps and much less with tungsten lamps. This will be noted by even a casual observer. He referred to the use of automatic regulators for lamp voltage. At present there is no satisfactory regulator available at a reasonable price, but he thought one would soon be upon the market. In some cases, as in subways, emergency lighting is necessary when the power supply is cut off. This requires a small battery with a few low-voltage lamps used for this purpose only.

G. H. Stickney favored the movement to equip lamps in street cars with reflectors. He pointed out that it is hard to change over old cars on account of the rewiring necessary, but these could at least be improved by using Mazda lamps which can be frosted. Tests are now being carried out on the New York municipal railways and the effects analyzed, and it is expected that these cars will be well equipped when the tests are finished.

V. R. Lansingh suggested that the substitution of bare tungsten lamps for carbon lamps increases eye strain, and that the advantages were on that account balanced by the decrease of eye comfort. The economy obtained by installing reflectors was not in itself as great as that introduced by a change of lamp, but he would rather see no change at all until the company was ready to change to a lamp with a proper reflector.

In reply to this, S. A. Fletcher inquired whether the fluctuation in intensity experienced with carbon lamps was not worse than the glare.

Ward Harrison, R. B. Ely and J. B. Jackson also spoke.

In closing the discussion, Mr. Hibben pointed out that reflectors are desirable from the point of economy as well as on account of glare.

Tuesday Session.

President Millar called the Tuesday session to order at 9:50 a. m. The first paper presented was by F. Park Lewis, M. D., on "The Psychological Values of Light, Shade, Form and Color." Dr. Lewis pointed out that the physical study of light was of little value unless the effect upon the eye was considered. Greater effects are produced on the mind through the eye than through any other sense organ. He pointed out the psychological development of the sense of sight and showed that the sensations produced are seldom exact and are usually influenced by memory of past sensations. Thus, the artists have learned that an exact picture or landscape is the least like the original, because it leaves no opportunity for the observer to supply from memory those things which have been

associated with previous views of the same object. He considered good lighting a large element in the attractiveness of the home, and an attractive home is an essential to good citizenship. Public libraries, especially, should be well lighted, but the lighting in them is usually atrocious. Fine specimens of architectural work are frequently accompanied by poor lighting, and daylight illumination especially is frequently neglected. Many schools have been constructed with poor daylight illumination, making artificial lighting essential. He proposed that one day each year should be devoted in the public schools to the subject of the conservation of vision and the hygiene of the eye.

This paper was discussed by G. H. Stickney, M. G. Lloyd and H. E. Ives.

C. E. Ferree then presented a paper entitled "The Efficiency of the Eye Under Different Systems of Illumination—The Effect of Variations in Distribution and Intensity."

This paper contained a report upon some experiments which were described at the Buffalo Congress on School Hygiene and reported in the issue of September 6, page 479.

This paper was discussed by J. R. Cravath, E. C. Crittenden, M. Luckiesh, E. B. Rowe, G. H. Stickney, Ward Harrison, F. Park Lewis, L. B. Marks, H. E. Ives, T. J. Litle, Jr., and R. F. Pierce.

Mr. Cravath, who had visited the laboratory of the author, described the arrangements and relative positions of objects in the room. He thought the paper indicated the direction in which future efforts of design should be made. The experiments with direct lighting were in rooms with white walls—how much worse would the results have been with dark walls? The paper indicated that the physical efficiency may be as high with indirect as with direct lighting, but this is not generally true.

Mr. Luckiesh considered the paper useful as showing the method of test rather than for the conclusions in regard to the different systems of lighting; for if the lighting units are kept out of the field of vision the same effects can be obtained with either direct or indirect installations.

Dr. Lewis thought the condition of the eye should be considered and that a preliminary to such a test should be a measurement of refraction and accommodation of the eye by an ophthalmologist.

It was pointed out by several of the speakers that the intrinsic brilliancy of the source was an important point and should be taken into consideration, and Mr. Pierce stated that the variation of efficiency with intensity of illumination might really be due to the variation in surface, brightness or intrinsic brilliancy of the source. The results indicate that we are ordinarily working with too high intrinsic brilliancy rather than with too high intensities of illumination.

In closing the discussion, Dr. Ferree put the blame upon the illuminating engineers for the classification of lighting installations which he had used and which had been severely criticised by several of the speakers in the discussion.

The next paper was by W. A. Darrah, entitled "Some Theoretical Considerations of Light Production."

Theoretical Considerations of Light Production.

This paper sets forth some of the inherent limitations of the various electric illuminants now in use, and discusses briefly the effect of these limitations upon the progress of the art of illumination. The basic theory of light production by the acceleration of electric charges is analysed with a view to indicating the relative possibilities of the various types of illuminants, particularly the arc and the incandescent lamp. It is demonstrated that to secure high luminous efficiencies selective radiation must be relied upon, and therefore unless new materials are discovered which exhibit selective radiation, while in the solid state, the efficiency of the electric arc will remain materially higher than the efficiency of the incandescent lamp.

This was followed by a talk by John W. Howell on "Current Developments in the Manufacture of Incandescent Lamps." Mr. Howell pointed out the rapid advance made in the last few years in the manufacture of metal-filament lamps, due largely to the prevention of blackening by the use f vacuum getters. Lamps with thin filaments end by breaking, but those with thick filaments from blackening of the bulb. The greater blackening in the larger sizes is due to the fact that the area of the bulb is not kept proportional to the surface of the filament, which increases in proportion to the candlepower. He showed the results of tests carried on at the factory. Some 100-watt, 100-volt lamps operated at 0.9 watt per candle showed 99 per cent of the initial candlepower after 1,000 hours of burning. Some 250-watt, 100-volt lamps operated at 0.75 watt per candle showed 90 per cent of the initial candlepower after 500 hours. One 400-watt lamp taken from stock and operated at one watt per candle is still burning after 7,000 hours of use. He then referred to the new nitrogen-filled bulbs which are used only with thick filaments, since with thin filaments the cooling effect predominates over the benefits of increased pressure. With filaments using more than five amperes of current, there is an improvement due to the presence of the gas. Filaments taking 12 amperes can be operated at 0.5 watt per candle and filaments taking 25 amperes at 0.4 watt per candle, with a useful life of from 1,000 to 2,000 hours. Mr. Howell then exhibited two lamps of this type; one of 500 candlepower and one of 5,000 candlepower. Another recent advance is the perfection of the operation of drawing the wire, so that the latter is of uniform size, and it is possible to make up lamps which are more uniform in candlepower than a photometer can measure.

The two last papers were discussed together, the discussion being opened by C. A. B. Halvorson, Jr., who referred to the bearing which the new type of incandescent lamp would have upon the status of the arc lamp. He showed lantern slides of the inclosed flame-arc lamp and curves giving the variation of candlepower with current. Lamps are available using less than 0.3 watt per mean hemispherical candlepower and types have been designed giving as low as 0.24 for the white flaming arc and 0.20 for the yellow flaming arc. By increasing the current used and consequently the wattage and candlepower, these efficiencies can be still more improved and a unit as large as 5,000 candlepower could be operated with 750 watts, as against 2.5 kilowatts in the nitrogen-filled incandescent lamp. The magnetite arc has a slightly poorer efficiency, but its spectral distribution is better than that of the yellow flame arc. The magnetite lamp can be improved in efficiency by increasing the voltage, thus running the intensity up to about 2,500 candlepower. Recent improvements have been made in the mechanism of the flaming-arc lamp, which is being simplified. He referred to one city where the average outage per night is only five out of 6,000 lamps.

Isador Ladoff gave some values for the approximate costs of 1,000 candle-hours of illumination from various classes of sources. With gas flames and carbon-filament lamps this cost is four to eight cents; with metal-filament lamps, Nernst lamps and carbon arc lamps it is 1.5 to 2.5. Using mantle burners with gas or oil, it is 0.7 to 0.9, while with the flame arc and the quartz-tube mercury-vapor lamp it is 0.2 to 0.4. These figures are based merely upon the cost of energy or fuel. If other operating costs are included the figures would be changed somewhat, but not the order of the classes.

Ward Harrison disagreed with the value by Mr. Darrah of three per cent as the radiant efficiency of tungsten at the melting point. He estimated this value at ten per cent for the nitro-

gen-filled lamp and it was thus evident that tungsten does not radiate like a black body. Using reflectors with the new lamp, it is probable that filaments as low as 0.15 watt per mean hemispherical candle will be obtained with the nitrogen-filled lamp, which will be equal to the best performances of the flaming arc. He considered the spectrum of the nitrogen lamp superior to that of the magnetite lamp and very close to daylight, although he had made no definite tests to prove this.

W. R. Mott referred to the great possibilities of the flame-arc lamps. It is now possible to make electrodes for white flames which are as efficient as the yellow-flame electrodes of a year ago, and developments are going forward rapidly. He referred to the effect of other bodies present in the flame upon the spectrum.

G. H. Stickney pointed out that the cost of current for a lamp is no longer so important as the cost of maintenance, and improvements in efficiency are not of great value unless maintenance cost can be kept down. To this Mr. Halvorson replied that maintenance cost must be considered for all types of lamp and that the regular attention necessary with arc lamps results in proper care for the lamp, while others are often neglected and dirt may be allowed to collect in such quantity as to cause great deterioration.

H. C. Chapin referred to an article in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for September 6, in which costs are given for the maintenance of various types of lamps used for street lighting as actually found by experience in Chicago. This showed that with fixed charges as well as operating costs considered, tungsten lamps cost slightly more than the flame arcs per mile of street.

Meeting in Soldiers' Memorial Hall.

On Tuesday evening a session was held in the Allegheny County Soldiers' Memorial Hall. After some introductory remarks, President Millar called upon Georges Claude to present a paper entitled "The Neon Tube Lamp." The presentation of this paper was accompanied by demonstrations of lamps filled with pure neon and others filled with neon to which mercury had been added. M. Claude also had upon the platform a tank of neon, from which he filled a small balloon. Another tube lamp was in the form of the written word "Luminescence."

Neon-Tube Lighting.

After sketching the discovery and commercial production of neon, the author told how various difficulties had been overcome. In the presence of other gases neon does not show luminescence, and it is consequently necessary to purify the gas after current is turned on by absorption with charcoal at the temperature of liquid air. To avoid the necessity for the automatic addition of gas, as in the Moore tubes, large electrodes are used, which do not become incandescent and the neon is then not absorbed. Five square decimeters per ampere are provided. With such tubes a life of 2,000 hours and more is obtained, with a length of 20 meters. The voltage required by neon is low, being about 800 volts for six-meter tubes. It gives 200 candles per meter at an expenditure of 0.5 watt per candle. With its light, visual acuity is high, but the color is unsatisfactory. This defect can be remedied by using tubes of neon in conjunction with tubes into which some mercury is inserted. This combination shows colors in almost their true value, with an energy consumption of 0.8 watt per candle.

In discussing this paper, D. McFarlan Moore sketched the history of his own work in vacuum-tube lighting, which had led up to the use of neon in a lamp of this type. The meeting then passed a vote of thanks to M. Claude for his address and demonstration.

A paper by W. A. D. Evans entitled "The Mercury-Vapor Quartz Lamp" was, in the absence of the author, presented by Bedford Brittain.

The Mercury-Vapor Quartz Lamp.

This paper points out the characteristics of the mercury-vapor lamp and the effect of using quartz upon its efficiency, quality of light, etc. A seal of invar metal was at first used. This has been superseded by a mercury seal. The wide application of the lamp industrially is shown by a number of installations. It is usually mounted high, the height for yard and street lighting being 40 to 70 feet. A table of wattages and heights for various applications is given. Its application for pathological purposes is considered. It has been applied to sterilize milk and water, for bleaching, photographing, moving pictures, etc.

Roscoe E. Scott then read an illustrated paper entitled "The Evolution of the Lamp." In this he sketched the early use of the candle and the oil lamp, showing many lantern slides of ancient and mediaeval designs of lamps and candle sticks. Little advance was to be noted from primeval times until the invention of the Argand burner. He sketched briefly the recent developments which have followed the introduction of gas and electric lighting.

Henry Hornbostel, the architect of the Memorial Hall, then described and demonstrated the unique lighting of this building, which makes use of the characteristics of the mercury-vapor, Moore tube, flaming-arc and carbon and metal-filament incandescent lamps. This installation was described in a previous paper before the New York Section, which was abstracted in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, December 17, 1910.

Commercial Day.

Wednesday was designated as Commercial Day and a long session was held, beginning at 9:30 a. m. and lasting until after 2 p. m. The chair was occupied by Vice-president Norman Macbeth. A telegram from Arthur Williams was read, as was also a letter from the Pittsburgh Jovians.

The first paper to be presented was one by R. B. Ely entitled "Church Lighting." This was followed by a paper by Edwin F. Kingsbury entitled "Experiments in the Illumination of a Sunday School Room With Gas." These two papers were discussed together.

Church Lighting.

It is inadvisable to stipulate the intensity of illumination, but a ratio of about 2 to 1 should be obtained between the chancel and the main portion of the church. Provision should be made for using a portion of the illumination before service begins. Watts per square foot vary from 0.3 to 2.5 with good installations. There is a tendency in favor of indirect lighting or concealed direct lighting. The semi-direct system has not been much used. Direct systems have been generally employed, owing to lower installation and operating costs. Among the general requirements stated are: no light sources should be within the line of vision; lamps should be hung sufficiently high so as not to obstruct the view from the gallery; fixtures should be placed so as not to obstruct the architectural features; where light sources are visible the intrinsic brilliancy should be reduced by frosting, etc.; hymn boards should be separately illuminated by a concealed source where the general illumination is low. Detailed discussion is then given to the illumination of the chancel and altar. Apparatus and fixtures are then considered in detail and the use of exterior illumination and signs is considered and illustrated.

Illumination of a Sunday-School Room.

The author describes the lighting by gas of a typical Sunday-school room, composed of a large central floor with a high glass-paneled ceiling and alcoves at the ends. Four 4-burner "arcs" having a magnet-valve pilot system of control from the main floor were placed above the ceiling to light the central area. The alcoves were lighted from the side walls by placing a large semi-circular translucent screen in front of each of the eleven upright burners. The object of these screens was to transmit part of the light directly and to reflect a portion back on to the wall. The whole forms a light source of large area and low intrinsic brilliancy.

The discussion was opened by Joseph D. Israel, who referred to the methods used commercially in influencing trustees of churches to adopt new installations.

J. R. Cravath mentioned that with the new form of tungsten lamps having helical filaments, cove lighting can be better controlled than formerly.

A. L. Powell considered an intensity on the horizontal plane of 0.75 to 1.5 foot-candles satisfactory in churches and Sunday schools where the eye is sheltered from glare. Proper glassware for this purpose is effective and

inexpensive. White leaded glassware is available and will often harmonize with church architecture. He preferred lighting the altar from the side rather than from overhead and had found aluminum-steel reflectors useful in the chancel—also tubular lamps with cylindrical reflectors. He showed several lantern slides to illustrate points brought out.

R. F. Pierce said that church people were sensitive to glare and the introduction of indirect lighting in such buildings shows that the glassware previously used has been inadequate. The mere reduction of intrinsic brightness was shown in Dr. Ferre's paper to be insufficient. He emphasized that the same effects obtained by indirect lighting had been obtained by direct lighting in the instances given by each of the authors. The element of intrinsic brightness is of more importance than the system of illumination used. The indirect system often fails to properly illuminate churches with Gothic architecture.

T. J. Litle, Jr., thought a church should be lighted upon the same principles as a theater, where all except the stage is in darkness during the performance.

E. B. Rowe, S. G. Hibben, F. C. Caldwell, G. H. Stickney and M. Luckiesh also joined in the discussion.

R. B. Ely, in reply to the discussion, pointed out that different intensities of illumination are often wanted in churches. For instance, Roman Catholic churches want high illumination upon such occasions as Easter; whereas at other times it should be dim. Consequently, the illumination should be arranged so that a part of it may be used separately. He thought that any system of illumination could be used effectively where the conditions were right. Church lighting is governed largely by architectural considerations.

E. F. Kingsbury then closed the discussion.

A. L. Powell then presented a paper by C. L. Law and himself entitled "Distinctive Store Lighting." This presentation was illustrated by colored lantern slides made by the autochrome process, the principle of which was explained by the speaker.

Distinctive Store Lighting.

Certain stores, namely the high-class shops, demand a striking individuality of design. This paper describes in detail several typical lighting installations which have come to the attention of the authors; it discusses a particular store of each of several classes: shoe, millinery, toy, candy, etc. Data are given as to the dimensions, wall, ceiling and floor coverings, arrangement of fittings, type of glassware, number and sizes of lamps, and a general description of the appearance of each store. This information may not be directly applicable to the design of a new installation, but since the lighting systems outlined are giving satisfactory service, the quantitative element may be of use and the novelty of some of the equipments may suggest to the designing engineer ideas which will be applicable to his particular problem.

M. H. Flexner inquired as to why lamp clusters were used so much in the installations described rather than large single units, which would be more efficient.

S. G. Hibben emphasized the need for harmony between finish, decorations and lighting fixtures, and that there should be co-operation between the illuminating engineer and the architect. Unfortunately the illuminating engineer is usually called in only for cases where an old installation has proved unsatisfactory, rather than for new installations. He called attention to some of the new varieties of glassware which are now available.

C. A. B. Halvorson, Jr., said that some of the most distinctive store lighting was done with arc lamps, especially the white flaming arc, which was valuable in cases where it was important to bring out true color relations.

R. B. Ely, D. M. Moore and H. C. Chapin also joined in the discussion. In closing, Mr. Powell stated that clusters were usually used because architects laid out the installations and also that burnouts would not be so noticeable.

M. H. Flexner then presented a paper by himself and A. O. Dicker entitled "Factory Lighting."

Factory Lighting.

Ever since the realization of the good and bad effects of illumination, there has been a great field in factories for better lighting conditions. Better light is as necessary as any sanitary requirements and with these it should rank among the first. Foreign countries have had committees appointed by the government, whose duties are to study the effects of good and bad light upon the general health and report upon methods of bettering conditions. Although the importance of good lighting is generally understood, managers of factories are often unwilling to make any decided changes from present operating conditions. No matter how forcible the arguments, the first cost of the installation of a lighting system seems to retard any change for better illumination. Figures are given showing what a small item in factory operating costs the lighting is, and the rental and maintenance system of the Commonwealth Edison Company is explained.

The discussion was opened by E. W. Lloyd, who stated that there were more returns to be obtained by the central station, manufacturers and engineers by pushing factory lighting than from any other cource. Its development has been slow and an examination of present conditions is startling.

G. W. Roosa stated that arc lamps are usually used in high buildings having bays and consequently a number of lamps, the individual variations of which were thus averaged up in the general illumination. With proper diffusing glassware the intrinsic brilliancy of these sources is only 15 candles per square inch.

H. H. Magdsick pointed out that in a certain plant the cost of lighting was about 13 cents per hour, while wages amounted to $19. Thus the cost of light was only in the ratio of 1 to 150 to cost of labor, and the difference between this cost and the cost of the cheapest lighting which could be installed was not more than 1 to 300. No manager would hesitate to supply one helper to 300 men to improve his output. He also referred to some results presented before the convention of the Iron and Steel Electrical Engineers, which will be found elsewhere in this issue.

S. L. E. Rose referred to a reflector for flame-arc lamps, recently designed, which gives over 10,000 lumens in the most desirable zone, equivalent to 0.07 watt per lumen.

R. B. Ely expressed the opinion that the small electric and gas companies should have an illuminating engineering department.

H. C. Chapin spoke of the importance of tests carried out under working conditions, since the presence of a smoky atmosphere, etc., will have much effect upon the actual illumination. Thus the light of the yellow flame arc penetrates such an atmosphere better than light from a white arc.

G. H. Stickney emphasized the importance to the central station of industrial lighting. This has sometimes been considered an undesirable load, but it is not so by any means.

V. R. Lansingh, Ward Harrison and H. A. Reid also joined in the discussion, which was closed by Mr. Flexner.

A paper by J. E. Philbrick entitled "Store Lighting" was, in the absence of the author, presented by H. R. Sterrett.

Store Lighting by Gas.

The gas-lighting installations of eight small stores are outlined in this paper. Plans showing the locations of test stations, and illumination readings of each store are included. The author emphasizes two points: (1) gas-lighting solicitors should have available for prospective customers accurate data on local lighting installations; (2) the need of proper maintenance to insure maximum efficiency and satisfaction.

R. F. Pierce discussed the details of the photometric measurements involved and Ward Harrison expressed the opinion that in tests with competitive illuminants the representatives of the competing concerns should be in-

vited to be present. The paper was also discussed by E. B. Rowe, T. J. Litle, Jr., and Norman Macbeth.

William S. Kilmer then presented a paper entitled "Hospital Lighting."

Hospital Lighting.

Shortcomings in hospital lighting are too well known to need mention; ordinary illumination devices for hospitals fail to give the proper quality and distribution of light. This paper treats solely of the lighting of the two most important quarters of the hospital, operating room and wards, and describes practical fixtures for the solution of the various problems. The operating table should receive not less than 25 foot-candles, and preferably 40. In the wards glare must be avoided, and both general and localized illumination should be provided, the general not exceeding one foot-candle from an indirect or semidirect source. The lighting of other portions of the hospital is not discussed, as the treatment is the same as for other buldings.

Harold Calvert pointed out that some hospital surgeons objected to fixtures directly over the operating table, since dirt may fall from them and infect the patient. Hence, four distributing units are considered preferable to one central unit. A bright ceiling is undesirable.

H. B. Wheeler did not agree that extreme concentration on the operating table was desirable, but thought that the light should be somewhat diffused, as otherwise there will be objectionable shadows. He considered an indirect unit with light walls and ceilings preferable, thus giving about 10 foot-candles on the working plane. This has been satisfactory where installed. In the wards it is desirable to have wall switches controlling fixtures. This lighting should be somewhat flexible, as for instance three different intensities available for night time, reading, and general illumination. Corridors should not be lighted like hotels or other buildings, since patients must be carried through them face upward from the wards to the operating room.

W. F. Little referred to the Zeiss system used in Europe, which gives 250 foot-candles on the operating table. He suggested that in wards an indirect system on the floor would give diffused light without placing any bright sources in the patient's range of vision.

In closing the discussion Mr. Kilmer spoke in favor of low intensity on the ceilings of wards. On the operating table he said surgeons had demanded high concentration and he thus figured on 40 foot-candles over the entire table. He had worked on Mr. Little's suggestion by using lamps imbedded in the floor. Architects are the principal objectors to this scheme.

Thursday Session.

The first paper presented at the session on Thursday morning was by H. B. Wheeler and was entitled "The Lighting of Show Windows."

The Lighting of Show Windows.

Typical show windows are grouped in three classes according to their relative dimensions, and special windows in two other classes. An illustration is given of each class of window and details given of the reflector used, method of installation, etc. Distribution curves are given for each form of reflector and a chart is given enabling the selection of the proper reflector for any given height of window front, height of background, and depth of window. The spacing of reflectors for typical conditions is given in a table. The results of tests upon the different windows studied are given in the form of illumination curves on the line of trim. The coefficients of reflection of walls, ceiling and floor were measured. For a typical floor the value is 25.9 per cent; for walls, 43.8 per cent; while the test plate having a mat white surface gave 75 per cent. Test results are given in detail with plans and elevation of the windows.

W. S. Kilmer questioned the advisability of some of the recommendations made. He considered 30 foot-candles too high for window lighting. Such a concentrated beam might develop sufficient heat to injure delicate goods. It is also less effective in bringing out details. He also took exception to the use of the test plate at an angle of 45 degrees in the measurements, as he has not found this to give the same results as when placed in a normal plane.

Walter Moulton said that although every expert advocates concealed lamps for window lighting, most of the windows are not so equipped. There is great room for work in this field and especially for co-operation between engineers and central stations. A good demonstration can be made by arranging a window with two sets of lamps and flashing from one to the other.

W. F. Little advocated the investigation of the surface brightness of the objects displayed in the line of trim. The readings given indicate the surface brightness only of a white surface in a certain plane.

J. R. Cravath agreed that the criterion of sufficient illumination should be the surface brightness. He thought that the method used by the author indicated this sufficiently. The dimensions of show windows should be chosen to fit artificial lighting. Where the height is great in comparison to the depth, the results cannot be good, since the illumination upon a vertical surface is necessarily low compared to a horizontal surface. This is a disadvantage for such things as dry goods, though not for some others, such as jewelry.

In closing the discussion, Mr. Wheeler said he had never heard of any damage due to the heat from a concentrated beam of light. The choice of intensity of illumination should depend upon the interior finish of the window.

The next paper, by E. C. Crittenden and A. H. Taylor, entitled "The Pentane Lamp as a Working Standard" was presented by Mr. Crittenden. This paper recommended the use of pentane lamps as secondary standards when electric standards are not available, and detailed the method of test used at the Bureau of Standards. The effect of variation in the quality of pentane and in the atmospheric conditions were considered and the necessary corrections given.

This paper was discussed by C. O Bond, T. J. Litle, Jr., C. W. Jordan and H. B. Gage.

The president then called upon E. W. Lloyd, representing the National Electric Light Association, to speak on the relation of the work to the societies.

Mr. Lloyd stated that he had at first been dubious as to the need or usefulness of the new society when the Illuminating Engineering Society was formed, bu he had come to the conclusion that it was of great value, especially as it includes manufacturers and others who are not represented in the National Electric Light Association. He referred to the commercial development in the N. E. L. A. and the prominence that the Commerical Section now has in its meetings He advocated co-operation between the two societies, with emphasis on the educational features, since most of the central-station men do not know enough about illumination.

The president also called upon W. D. Weaver, one of the charter members of the Society instrumental in drawing up its constitution, to stand up. Norman Macbeth made a few remarks regarding the Society for Electrical Development.

S. L. E. Rose then presented his paper entitled "The Illuminating Engineering Laboratory of the General Electric Company." This paper described the building and some of the equipment of the department, which was moved from Lynn in 1909 to Schenectady. It is now equipped for making tests of all kinds of illuminants, the work being divided into four main divisions: (1) commercial investigations and applications; (2) photometric testing and development; (3) research; and (4) photographic. The paper was illustrated with lantern slides. It was discussed by G. H. Stickney.

A paper by F. K. Richtmyer, entitled "The Photo-Electric Cell in Photometry," was presented in the absence of the author by H. E. Ives. This paper pointed out the possibility of using the photo-electric effect for photometric measurements. Certain metals such as sodium and potassium when exposed to

light give off a stream of electrons which is proportional to the intensity of illumination. This electric discharge can be measured by an electrometer or galvanometer. To use this effect photometrically, the sensibility curve for the metal for different wave-lengths must be determined and compared with a luminosity curve for the human eye. A special set of absorbing screens would then be necessary to correct for this difference. The cell will be useful for some special purposes, since it can act as a time integrator of light intensity.

This paper was discussed by J. L. Minick, S. L. E. Rose, and H. E. Ives. The latter pointed out the enormous range of sensibility possible in this method and the ease of obtaining readings. The color sensibility varies with the metal and for cesium, the maximum comes at the same wave-length as for the human eye. For less sensitive work a portable galvanometer may be used.

A paper by E. J. Edwards and Ward Harrison entitled "Some Studies in Accuracy of Photometry" was then presented by Mr. Edwards.

Some Studies in Accuracy of Photometry.

Five separate investigations are reported in this paper: (1) Relative accuracy of Bunsen and Lummer-Brodhun devices. This test, involving several thousand readings, showed the sensitive, expressed in average deviation, to be 0.4 per cent for Lummer-Brodhun as compared with 1.4 per cent for the Bunsen. (2) Magnitude of error due to parallelism of rays, in the photometry of reflector scources. The results of tests on typical reflectors for general illumination purposes show the errors to be negligible. (3) Method of investigating adjustment error, and the calibration of portable photometers. This method consists in taking photometer readings for various distances from a working standard lamp and analyzing the results by reducing the relation to a straight-line function. The constant of the photometer is obtained from the slope, and working standard intensity. (4) Errors in illumination measurements due to failure of test plate to obey the cosine law. Discrepancies between measured and calculated values of illumination are fully accounted for by this investigation. The average error of the plates investigated was found to be over 10 per cent at 45 degrees. Computations show that the photometer results for an average installation are about 12 per cent low. (5) Method of obtaining and recording distribution data. A so-called thousand-lumen basis of drawing distribution curves is proposed, in order to avoid error and confusion in comparing reflector units. On this basis zonal lumen values are instantly convertible to per cent of total, and intensity values to per cent of horizontal for the bare lamp. By using a single multiplying factor all values can be corrected to current lamp efficiencies.

W. R. Mott said that it was customary to use the inverse-square law in searchlight work and the error amounts to only a few per cent until one gets within a few feet of the arc. This is probably due to the fact that it is hard to get a reflector to give a really parallel beam. He explained the use of photographic paper in getting distribution curves, about 100,000 readings per year being taken at the works of the National Carbon Company by this method in arc lamp work. This eliminates the difference between different observers and the effect of a flickering light.

W. F. Little found the inverse-square law good with parabolic locomotive headlights up to within 30 feet of the source.

M. Luckiesh, S. L. E. Rose, L. J. Lewinson, T. H. Amrine, I. Ladoff and H. E. Ives also joined in the discussion.

In answer to a question, Mr. Edwards stated that at first the observers had found the time of observation and the fatigue greater with the Lummer-Brodhun photometer, but at the end of a week the settings could be made more rapidly. The results given applied to observers with equal experience on both forms of photometer.

The afternoon session was opened by a paper by V. R. Lansingh entitled "Characteristics of Inclosing Glassware." This paper divided inclosing glassware into two classes, one of which is purely transmitting and diffusing, such as ground, opal and leaded glass, and the other employs the principle of specular reflection, as the prismatic glassware. Distribution curves and data were given to show that little except good diffusion and low absorption may be expected of the first class, the redistribution of light being negligible. With prismatic glassware the distribution may be varied as desired. The absorption in both cases is about the same.

S. G. Hibben considered the data given valuable, but thought undue emphasis had been laid upon the distribution of light and spoke of several kinds of opal glass which gave a redistribution of the light. The statement that redistribution was negligible with this type of glassware applied only to spherical globes. Such globes should not be used where efficiency or definite distribution was the object, but rather where the end sought was beauty or the decrease of surface brightness.

H. S. Dunning spoke of tests using the new Mazda lamps containing vacuum "getter" in inclosures, and no appreciable change in the life due to such inclosure had been found.

A. J. Sweet had found the classification of glassware justifiable and said that individual specimens had qualities which only varied within the class limits. He referred to the results of tests made at Cleveland upon the lighting of railway coaches, where both inclosing globes and reflectors had been used. These tests confirm the statements in the paper as to the control of distribution. For this purpose he had found the mirrored reflector to be most suitable, the order of merit of the other glassware being, prismatic reflector, 83 per cent; heavy density opal 74 per cent; deep reflector bowl, 68 per cent; medium density opal, 62 per cent; prismatic satin finish, 60 per cent; light density opal, 55 per cent; C. R. I. shade used in Pullman cars, 39 per cent; opal acorn, 32 per cent. These percentages are relative to the mirrored reflector which is taken as 100 per cent.

A motion was then passed referring to the Committee on Nomenclature for consideration the terminology of glassware. Another motion referred to the same committee the classification of systems of lighting.

Vice-president Cravath then took the chair while the report of the Committee on the Presidential Address was made by G. H. Stickney, chairman. This report dwelt upon the importance of the address, as indicating the present status of the art, and recommended it to the perusal of every member. A motion that the report be accepted and the recommendations be carried out was then passed.

George S. Barrows then made a report for the Committee on Resolutions.

Secretary J. D. Israel then presented the report of the Council which dwelt upon the educational and co-operative work which had been carried on and included a financial statement showing the expenses for the year to be about $8,400, while the receipts amounted to $9,000. There was a net gain in membership of 62. Sustaining members to the number of 23 had been admitted from the ranks of manufacturers, central stations, gas companies, etc.

President Millar then introduced the president-elect, Charles O. Bond who made an appropriate response to the warm reception which was accorded him.

L. B. Marks then presented a resolution of appreciation of President Millar, which was unanimously adopted and the convention adjourned.

Entertainment.

On Monday evening there was a reception and ball in the ball room of the Hotel Schenley.

On Wednesday evening the annual banquet was held, music being furnished by the Westinghouse Band. H. S. Hower, of the Reception Committee, presided and introduced the toastmaster, Gen. George H. Harries, who directed affairs in his usual happy vein in competition with Table Ten and other hilarious groups. Addresses were made by President Millar, President-elect

Bond, Charles M. Bregg, and "Uncle John" Brashear, the famous lens grinder. On Wednesday afternoon the members of the Society were guests at a National League baseball game.

On Tuesday afternoon a visit was made to the works of the Westinghouse Electric & Manufacturing Company at East Pittsburgh, special cars being provided for this trip. On Wednesday afternoon visits were made by two separate parties to the Carnegie Steel Works and to the Pittsburgh Lamp, Glass and Brass Company.

At noon on Thursday a Jovian lunch was held at the Hotel Schenley, Statesman F. M. Knapp presiding. Short addresses were made by Preston S. Millar, C. A. Littlefield, L. B Marks, Norman Macbeth and George Webster Music was furnished by the orchestra of the Western Union Telegraph Company. On Thursday evening there was a theater party for all.

Other entertainment was provided for the ladies during the sessions. On Monday afternoon there was a card party at the Pittsburgh Athletic Association. On Tuesday morning, the factory of the H. J. Heinz Company was visited, where luncheon was served and return made by automobile through the parks. On Thursday afternoon a visit was made to the Carnegie Institute and the Margaret Morrison School.

The Operation of Diesel Engines.

The British Government Inspector of Factories, in reporting upon his investigation of the Diesel engine explosion which occurred at the electricity works at Bray, Ireland, some time ago, has made a number of suggestions for reducing the risk of such explosions and accidents with the running of Diesel oil engines. He says that compressed oxygen, on account of its intense chemical affinity, and combustible gases like hydrogen should not be used for the purpose of recharging air vessels, and a warning to this effect should be issued by the engine makers, who should also issue definite instructions with regard to the adoption of safe methods for re-charging air vessels. Only competent engineers or experienced men under the direct supervision of a qualified engineer should be employed as engine attendants in Diesel plants. Traces of oil or oil vapors should be removed as far as practicable from the compressed air before it passes into the blast vessel. Air vessels, especially blast vessels, should be cleaned and examined internally as far as practicable once every twelve months. They should also be tested hydraulically once in every four years and the amount of expansion of the vessel under the test pressure should be carefully gauged.

INDIANA ELECTRIC LIGHT ASSOCIATION.

Annual Convention at Indianapolis, September 24 and 25.

The fifth annual convention of the Indiana Electric Light Association was held on Wednesday and Thursday of last week at the elegant new club house of the Indianapolis Canoe Club, which is beautifully situated on a bend of the White River at the outskirts of Indianapolis. This convention was the most successful yet held by the Association, both in attendance and in the keen interest manifested in the proceedings. The total registration was 187 and the actual total attendance was considerably over 200. An interesting feature of the meeting was the close attention paid to all of the proceedings, even the accounting session drawing a large and attentive gathering. Most of the convention's work dealt with utility regulation, this naturally following upon the appointment last spring of the Indiana Public Service Commission.

Governor's Address.

The first session was opened shortly before eleven o'clock on Wednesday morning by President J. W. Robb, of Clinton. He introduced Governor Samuel L. Ralston of Indiana, who delivered a very cordial address of welcome. He spoke of the broadening of the public spirit throughout the land. Referring to the subject of the public utility legislation of the last winter, Governor Ralston said he had hesitated a long time before placing his approval upon the act that was finally passed, because he had a strong leaning toward making home-rule government as extensive as possible. However, in the rapidly changing economic conditions of the present day it was necessary that communities must relinquish some of their old prerogatives for the good of the commonwealth as a whole. There is manifest throughout the land a general movement for the regulation of public utilities; this recognizes the monopolistic character of their service but aims to prevent the evils attendant on unrestricted monopoly. In the regulation of public utilities it is of prime importance, of course, to promote the public interest but, at the same time, it is necessary to conserve the large investments made in the utilities and to insure a reasonable return upon them. For the most part the public is, or should be, inclined to pay rather a little more for utility service of the proper kind than to pay less and get the poor service that is usually involved in very low rates. In conclusion, he said that he believed that the commission that had been appointed in Indiana consists of fair and broad-minded men and that this commission will work harmoniously, both with the utilities and with the public.

President's Address.

Mr. Robb then presented the annual presidential address in which he paid attention to the organization of the Association in 1908 and to its growth to its present standing. The past year has been the most successful one in cementing the entire membership in the bonds of close friendship. This was brought about largely by the culmination of the efforts of several years aiming toward the enactment of a public utility law in Indiana. These efforts have been particularly successful and in them the Association took a most active part; the result is that Indiana possesses one of the best statutes dealing with public utilities that is to be found in the country. Throughout the preliminary work in the drafting of the act and during its progress through the Legislature there was enjoyed the cordial co-operation of the State authorities. The men who have been appointed to the Public Service Commission created by the act are of a broad and fair-minded type, which is most favorable to an equitable carrying out of the new era of commission regulation. President Robb said that if it develops that defects exist in the law amendments to it will doubtless be made in due time to rectify them. It must be remembered that public utilities are quasi-public bodies and that they must expect to give as well as to receive fair dealing.

Taking up Association affairs, Mr. Robb said that an active membership campaign is imperatively needed, both to increase the influence of the Association and also to spread out the burden of supporting its work over a larger portion of the Indiana lighting companies. In order to permit carrying on the broadened work which is planned by the Association during the coming year, it is imperative that its funds be decidedly increased, perhaps by raising the annual membership dues. Frequent reports to the member companies on the work of the Commission should be continued. Many changes have occurred among the Indiana companies through consolidation and through acquirement of various plants by large holding companies. He urged the latter to support the work of the Association more generously than heretofore, since their investment in Indiana properties is guarded by it.

Secretary-Treasurer J. V. Zartman then presented his annual report. In this he also referred to the creation of the Public Service Commission after some six years of agitation of the sub-

ject. The Commission needs the intelligent and hearty co-operation of all of the utility companies. In Indiana there are about 210 central lighting plants of which 60 are municipal plants. Of the remaining 150, something over one-third are active members of the Association. Persistent efforts were made during the last year to increase the membership among the lighting companies and these should be continued with renewed energy. In his treasurer's report Mr. Zartman showed that the balance at the end of the fiscal year was larger than at its beginning, but the financial demands on the Association during the coming year will doubtless be very heavy and necessitated active measures to swell its funds.

N. M. Argabrite on behalf of the Finance Committee presented a brief report in which he called attention to the generous offer of C. C. Perry, of Indianapolis, who had guaranteed to finance the present convention to any extent to which aid outside of the Association funds would be necessary. The subject of increasing the annual dues was brought up and discussed, but deferred for final action until the report of the Executive Committee, in which it was expected that some definite action on the subject would be recommended, was to be presented.

F. A. Bryan, South Bend, discussed the changes that had come about in the last few years in the condition of the lighting plants throughout Indiana and also in the activities of the Association. The problems now up for discussion are entirely of a different character from what they were when the Association was organized. He felt that these changes are so profound that it would be well to have a complete revision of the Association's constitution and by-laws so as to bring its organization right up to date and in line with the requirements of present conditions. T. C. McReynolds, Kokomo, concurred in Mr. Bryan's remarks and on his motion it was decided to appoint a committee of three to confer with the executive and advisory committees in the revising and drafting of a new constitution and by-laws.

C. C. Perry, Indianapolis, presented a brief report of the work of the Advisory Committee. Mr. Bryan said that Mr. Perry was too modest in his report because an enormous amount of work had been done by both the Advisory Committee and the Executive Committee in connection with the legislation that finally resulted in the new Public Service Commission. Nearly all the members of these committees had spent anywhere from several weeks to a month or more in Indianapolis during the enactment of the legislation. President Robb emphasized Mr. Bryan's remarks and named a large number of men who had been most liberal in devoting their time and energy in the promotion of this work. Before the close of the session President Robb appointed J. T. Kester, E. Darrow and G. E. Varney as the Committee on Resolutions.

The Indeterminate Permit.

The afternoon session on Wednesday began with an address by J. L. Clark, a member of the Public Service Commission of Indiana, who took as the subject of his talk the indeterminate-permit features of the recently enacted public utility law. In opening his remarks, he said that Governor Ralston and the entire commission which he had appointed have only one common ambition, which is to have a perfectly fair execution of the law. The utility business in many ways is naturally monopolistic. Hitherto franchises have been eagerly sought and it is generally believed in many cases that they have been obtained by more or less mysterious and underhand methods. The feeling that graft was instrumental in the securing of many franchises brought about many restrictions on their grant, some f which doubtless were too onerous. Attempts have therefore been made to develop an ideal form of franchise and, in the opinion of most economists that have given the matter appropriate consideration, the indeterminate permit is believed to be the best form of franchise. For some years it has already been used in Wisconsin and Massachusetts and even the Federal Government has made grants of this character in Washington, D. C., and in the Philippine Islands and in Porto Rico. Respecting indeterminate franchises the new Indiana law is practically equal to that of Wisconsin but also covers telephone, street-railway and interurban-railway companies. It provides that all new franchises must be of this kind. Judge Clark gave many of the details of the new law covering indeterminate franchises. One feature, which is in the nature of a saving clause, probably requires revision. This provides, in case the law is at any time repealed, that the original franchises possessed by utilities and surrendered for the indeterminate permit should be restored; however, this does not cover such utilities as have no original franchises other than the indeterminate type that is being granted from now on.

Judge Clark called attention to the many advantages of the indeterminate franchise both to the utility and to the public. For one thing the utility does not need to provide an amoritization fund regarding its franchise; its securities are on a much more substantial basis; competition from other plants is eliminated as long as the utility provides adequate service. The law provides for an automatic issue of an indeterminate permit by the surrender of any existing franchise before July 1, 1915. Judge Clark explained the simple manner in which this surrender should be made. The law retains to the municipalities reasonable control of the service, and also requirements for extensions under reasonable conditions; these municipal regulations may be reviewed by the state commission, however, on request. The Indiana law also permits a municipality to start a competing plant, but not if the existing plant has an indeterminate franchise and is giving adequate and reasonable service. In conclusion, he pointed out that all features of the law aimed to be of equal benefit to the public and to the utility companies. He urged all the latter to secure the indeterminate type of franchise and to adopt, as soon as possible, the system of uniform accounting provided for.

Rate Regulation.

William J. Norton, secretary of the Rate Research Committee of the National Electric Light Association, then presented a paper entitled "The Two Epochs of Rate Regulation." This paper is the same one that he presented before the Michigan Association a month ago and was published in full on pages 379 to 381 in our issue of August 23. The substance of the paper is to urge a preliminary period, varying from 15 to 20 years, during which commission regulation be of the most liberal kind so as to permit the utility companies to adjust themselves to the new conditions. After this period all interests will be ready for theoretical regulation based on the cost-of-service theory in determining rates. Mr. Norton strongly urged utility companies to adopt the plan of self-regulation by gradually reducing rates wherever possible, since this, in practically all cases, produces a great increase in business which more than compensates for a slight reduction in revenue per unit of service provided.

T. C. McReynolds concurred in Mr. Norton's recommendations and stated that most companies have endeavored to be fair to the public. They have reduced rates wherever possible, not only to stimulate increased business but also to encourage the good will of the public. It should be noted that electric rates have steadily gone down while the rates of other commodities have been either stationary or gradually going up. The utility commission should help to educate the public to

a more reasonable attitude toward the utility companies.

F. A. Bryan, South Bend, stated that in order to get large power business it is usually necessary to meet the competition of private isolated plants, consequently such business, if taken over, must be at very low rates which provide but little profit to the utility but which are ultimately of great good to the system by improving the load-factor and permitting the use of larger generating units of greatly improved efficiency. Therefore he wished to know what is the attitude of various commissions respecting the granting of such rates as do not provide the same margin of profit as the great bulk of the business.

E. L. Kennedy, Rockport, said he had been following the trend of commission regulation for a great many years and had been in hearty accord with it. Regarding such low rates as Mr. Bryan had found necessary in some instances, he said that they may be offered but must not be below the cost of the service because otherwise they would be unfair to other customers. Companies should be free to and should attempt to develop all business that will ultimately reduce generating costs. He has made extensive trials of electric cooking, particularly of the so-called fireless type, with good results; but he was convinced that a general supply of electricity for this purpose on a competitive basis can be provided only on very low rates, such as with the heating load connected to a separate meter, therefore every effort should be made to improve plant and generating conditions so as to permit a reduction of the generating cost, even of small plants, to below one cent per kilowatt-hour. If this can be done he was convinced that electric heating and other desirable loads could be added indefinitely.

Mr. Norton said that as yet only three of the public service commissions had made special provision for the exceptionally low rates referred to by Mr. Bryan; these are the Massachusetts Commission, the New York State Commission of the Second District, and the Wisconsin Commission. It has been recognized that there are two classes of service; one competitive in which isolated plants must be reckoned with, the other is the non-competitive type, such as residence service. The Wisconsin Commission several years ago openly advocated the taking on of low-rate business if it will improve the load-factor or the generating conditions on the whole. In reply to a question by T. W. McNamie respecting the commission stand on the development of a business, Mr. Norton stated that a few commissions recognize this in one form or another, the Wisconsin Commission for instance including it as going value. E. J. Condon, Angola, said he had followed the rulings of the Wisconsin Commission quite closely and called attention to a number of cases in which rates were raised after an investigation had disclosed that insufficient revenue was provided.

Practice before Commissions.

W. H. Wherry, of New York City, made an address on "Practice before Commissions." He pointed out that public service commissions had complicated functions to perform, partly legislative, party administrative, but principally judicial and it was of the latter that he spoke particularly. As a judicial body a regulating commission forms a unique court with limited jurisdiction. The cases that come before it are almost entirely of an economic character. Such cases have proven very vexatious to courts on the whole, as is evidenced by the frequency with which they have reversed themselves on the few economic problems with which they have been called upon to deal. With commissions, however, the economic features predominate and in all cases the decisions must be in accord not only with good sense but also with absolute justice. The common statement that controversies involve a utility company against the public are erroneous, because both these interests are, or should be, identical economically. He quoted the work of Charles Francis Adams, the leading railroad commissioner of Massachusetts and who early showed that the interests of a utility and of the public are identical. Taking up more specifically problems that come up before commissions, Mr. Wherry cited many cases in which it had been necessary to raise the schedule of rates, some of these being municipal plants. In cases of overcapitalization, which has heretofore been generally sanctioned, commissions should not attempt, and the courts will not permit, the regulation of past issues of securities when new issues are to be made. Nor should account be taken of any accumulated surplus in regulating rates. The most successful commissions have been open minded, trying to see both sides of the controversies brought before them and to evolve the solution that will best help both sides. In conclusion, he said that both attorneys and their clients in coming before commissions must take this same attitude of trying to bring about a solution that will be mutually advantageous to both parties.

The subject was briefly discussed by T. C. McReynolds, who strongly commended the work of Mr. Wherry and the ideas which he had so eloquently expressed. He also commended the Indiana Public Service Commission and expected that all utility companies in Indiana would soon some to appreciate the work which this commission had started to perform for them.

The session closed with the appointment of the Nominating Committee which consisted of T. A. Wynne, P. H. Palmer and J. P. Ohmer. T. H. Bibber, of St. Louis, spoke briefly but eloquently of the objects of the Jovian Order, which he strongly commended to all electrical men. G. D. Smith, of the General Vehicle Company, spoke briefly of the value of electric-vehicle load to any central station, showing that it is off-peak in character. He spoke of the publicity work undertaken by the Electric Vehicle Association of America and urged all central-station companies to adopt a consistent attitude toward the electric vehicle by making liberal use of it for their own purposes, as well as supplying current for the charging of customers' cars.

Wednesday evening was devoted to the annual banquet, which formed the principal entertainment feature of the convention. Vaudeville features were introduced between the courses. A rejuvenation of the Jovian Order followed, at which a large number of candidates were initiated.

Accounting Practice.

The Thursday morning session was given over almost entirely to questions of accounting. It was presided over by F. L. Dennis, South Bend, who called attention to the system of accounts promulgated by the Indiana Public Service Commission. No office forms have yet been drawn up but the annual reports are to be practically like those specified by the Wisconsin Commission. Since there are a considerable number of points somewhat vague in the new accounting system to which Indiana companies must conform, it was considered desirable to organize a committee of the Association to advise the member companies respecting these points and, if the questions arising were of such character as could not be definitely answered, to refer them to the Public Service Commission for a decision. The service of this Accounting Committee will be particularly valuable to the smaller companies who need the most help in organizing or reorganizing their accounting work. By taking advantage of the work of this committee, these companies will for the most part be saved the expense of engaging an expert accountant.

The Accounting Committee had drawn up a list of 66 questions respecting approved practice in the classification and detailed handling of a va-

riety of accounts. These questions had been submitted at the request of the committee by various member companies, and cover practically all features of an accountant's work. Mr. Dennis read off the questions, one by one, and then each was thrown open to general discussion. Many of these it was impossible to give definite answers to, since their solution depended upon future official action by the Commission. Respecting some points there was considerable difference of opinion, and these were thrashed out. The session continued for nearly three hours and keen interest was maintained on the part of all in attendance, among whom were a number of ladies, expert in accounting and auditing. Participating in the general discussion were F. L. Dennis, N. H. Kennedy, J. J. Albion, J. T. Kester, F. A. Bryan, T. Donahue, W. H. Palmer, L. H. Heinke, C. A. Walker, E. J. Condon, F. W. Drager, C. E. Layton, T. F. Grover, W. D. Ray, C. Trees, H. K. Stark, Mr. Houghton and others.

Judge Duncan's Address.

During the accounting session, T. C. Duncan, chairman of the Public Service Commission of Indiana, who had dropped in during the meeting, was called upon to make an address. Judge Duncan said that the Commission realized it has great opportunities and also great responsibilities. It recognizes fully the great duties devolving upon it and every member of the Commission aims to do his work earnestly and honestly regardless of personal consequence. During the period of transition in which the utilities and the public must gradually conform to the new conditions, he asked that indulgence be granted the Commission. If it makes mistakes, they will be of judgment but not of the heart. He felt confident that the Commission will be ready to reconsider and revise its regulations and rulings if mistakes in these are pointed out.

From the data gathered by the Commission during the past five months, Judge Duncan said he had been amazed at the large investment in utility companies in Indiana and also at the heavy financial obligations of these utilities. From preliminary figures at hand, he believed that the indebtedness of the Indiana utility companies amounts to nearly one billion dollars. The Commission is thoroughly mindful of these utility obligations and will do its utmost to conserve them, being particularly mindful of the interest that must be met. The Commission must protect wise investments, but it cannot stand back of excessive charges to boost unwise investments. The Commission has many functions, many of which are quasi-judicial. Some displeasing rulings will doubtless be necessary to reduce rates that are unjustly high. On the other hand, some utilities have rates that are manifestly too low and which must be raised in fairness to all parties.

Judge Duncan said that among the many matters brought before the Commission he had been surprised at the large number of complaints arising from lack of courtesy on the part of employees. The public deserves to be treated with civility and quickly resents discourtesy and insolence. He therefore strongly urged the managers of utility companies to school their employees in courtesy and kindness to their customers. Attention to this natter will doubtless remove what is probably the most grounded cause of ill will toward utility corporations. Along the same line, he also urged a reduction of the penalizing of delinquent users. This helps but very little in the collection of accounts but does enrage a considerable element of the public.

There is no disposition on the part of commissions to treat the utilities unjustly, but customers' and public interest must be safeguarded. The ownership of public utilities is not purely private. In fact, more largely it is a trusteeship subject to just regulation. There are two theories of rate making, in the East more stress is put on the value of the service rendered, whereas in the West and Northwest, the cost-of-service theory is more generally believed in. These latter ideas are being worked out regarding interstate railways, and in a few years, probably all railroad rates will be based on the cost of service plus a reasonable return on wise investment. In conclusion, Judge Duncan said he thoroughly believed in regulated utility monopolies.

Service.

The last session of the convention began on Thursday afternoon with an address on "Service" by W. G. Huddle, who was then engaged in making a valuation of gas properties in Indianapolis. Speaking of his experience with public service commissions, he said it is coming to be generally believed that utilities must render the best possible service and that it is more important to look after this feature than merely to seek the lowering of rates regardless of the quality of service provided. The first attempt at electric service regulation was insistance on the accuracy of meters. Subsequently attention was directed to voltage regulation at the premises of customers. Insuring continuity and reliability of service is also of great importance. Mr. Huddle cited his experience with service regulation in Wisconsin. The inspection corps kept track of service conditions and notified companies that were rendering poor service; as a rule this was sufficient to remedy the evil, and companies have not been penalized. A utility company should instigate service regulation itself. However, the service-inspection staff of the regulating commission can do good work in suggesting improvements to the companies, especially to the smaller utilities.

Rates.

F. A. Newton, of Detroit, Mich., then presented a paper entitled "Rates." In all rate making, he said, the cost of the service is probably the most important element. In all cases this is a local problem, and comparative rates in different towns are of little practical value without knowledge of the conditions. It is necessary to make a close separation of demand and output costs and each customer should bear his equitable share of each of these costs. A statistical analysis is necessary of consumers' and operating costs. Simple flat rates and straight meter rates, also those based on quantity only, are inequitable to the whole body of consumers and must be modified in nearly all cases. Consideration must be given to the maximum demand and to the time of this demand. The rate system should be flexible to permit of future growth in the service.

The classification of consumers on the demand basis is a very important although difficult and intricate problem. Maximum-demand meters are good but rather costly. In determining the demand charge, where a maximum-demand meter is not used, it is better to consider the active load than the connected load. But in all cases, the proper percentage of the active to the connected load must be determined on exhaustive investigation and analysis of the various classes of customers. Such analysis will often show that residence customers constitute a desirable load, contrary to common belief. Additional business at special low rates that do not yield some profit must not be taken on, but such business is desirable if it yields at least a small profit and brings about other benefits to the system as a whole. Appropriate schedules can then be established to cover such service. Where optional rates are offered, they should always be under at least a yearly contract; such a system is not necessary in smaller plants, but has some advantages in the case of large utilities where it is desired to make every effort to please the patrons. In conclusion, Mr. Newton said that the earnings as well as expenses must be carefully audited.

Inter-Insurance.

L. T. Block, of St. Louis, Mo., read a brief paper explaining the organization and practice of the Utilities Indemnity Exchange. This concerns itself chiefly with assuming indemnity obligations of member utility companies at a great reduction in cost of this service compared with the old-line liability companies. The latter have recently made enormous increases in their rates. Relief from this is found in inter-insurance organizations, of which there are now quite a number covering various industries. The Utilities Indemnity Exchange deals with public utilities alone; it eliminates most of the overhead expenses, including lawyers' fees, and pays all claims directly to the injured parties. Mr. Block pointed out the details of the plan and compared it with the practice of the old-line companies. Surplus earnings are returned to the member companies of the exchange. Recently the activity of this exchange has been increased to cover fire insurance also, with likewise great saving to the members of the exchange.

E. J. Condon spoke of the difficulties attendant on trying to get fair dealing from the old-line companies. The very large utility companies as a rule carry their own insurance reserve at great saving to themselves. For the smaller companies, the plan of the Utilities Indemnity Exchange is an excellent one to carry out the same general practice and he heartily commended it to the members of the Association.

Electric Heating.

A paper on "Electric Heating" by John S. Staudt, of Purdue University, was presented by title, owing to the unavoidable absence of the author. Professor Staudt's paper deals with the most modern views of house and car heating, showing cuts of some of the latest types of heaters. The theory of electric heating is discussed. Reference is made to the fact that the heating element of most heaters is so arranged as to eliminate self-induction or mutual induction when operating on alternating current, thus allowing for unity power-factor in nearly all cases. In figuring heat losses in buildings, methods suggested by Kent, or by Carpenter's formula may be used. For maximum efficiency a large radiating, or reflecting surface is recommended. It is suggested that electric heating of buildings will eventually find manifestation in three forms: 1, direct radiation; 2, direct-indirect system, in which the radiators are placed in air stacks behind the registers, the air being circulated through the stacks due to gravity in small buildings, and by means of blowers in large buildings; 3, electric boilers. The subject of car heating is treated at some length. A comparison of manual with thermostatic control shows that the latter uses only about 34.2 per cent of the power required by the former. Concerning the future demand for electric heating, the author asserts that in order to compete with other means of heating, electrical energy ought to be sold for heating purposes at the rate of one cent to one-half cent or even less per kilowatt-hour. At present this can only be done by well designed and properly managed hydroelectric plants.

Concluding Business.

The report of the Executive Committee was presented by Thomas F. English, Muncie. It contained three recommendations for the appointment of as many new committees. These are as follows: a public service committee to report monthly on the work of the Public Service Commission; an accounting committee to act as a clearing house of problems relating to the accounting departments of the Indiana electric companies; a membership committee to make an active campaign for increasing the Association membership. After some discussion, the report was adopted, the recommendations to be incorporated as amendments to the constitution, the drafting of these being left to the Committee on Revision of Constitution. President Robb appointed as members of this latter committee, F. A. Bryan, W. D. Ray, and N. M. Argabrite. A motion was made authorizing the Executive Committee to take appropriate action to increase the annual dues to such an amount as it sees fit. A motion was also passed that member companies be requested to send their accounting forms to the Accounting Committee.

The Nominating Committee submitted its report which was adopted unanimously. The election of officers for the ensuing year thereby resulting was as follows:

President, Thomas F. English, Muncie.

Vice-president, W. D. Ray, Hammond.

Secretary, Thomas Donahue, LaFayette.

Treasurer, J. T. Kester, Noblesville.

Executive Committee, J. W. Robb, C. C. Perry, F. A. Bryan, T. F. Grover and C. N. Wilson.

Advisory Committee, T. C. McReynolds, A. C. Blinn and T. W. McNamie.

Finance Committee, N. M. Argabrite, O. C. Cover and A. J. Hertz.

President-elect English was introduced and made a brief address expressing his deep thanks for the honor conferred upon him. J. T. Kester, on behalf of the Resolutions Committee, reported resolutions expressing the gratitude of the convention to the governor of Indiana, the members of the Public Service Commission and others, whose participation had been so instrumental in the success of the convention.

The convention was closed by a brief address by Retiring-president Robb, who expressed his thanks for the cooperation shown him throughout his administration.

The Society for Electrical Development Activities.

The Society for Electrical Development has in the printer's hands a list of its members as of October 1, 1913. The list will be published in pocket-size booklet form and will be mailed to members of the Society within a few days. The membership is well over the 600 mark and new applications are being received at an average rate of from three to five per day. Only partial returns have been received by the Society from the Jovian campaign for membership. None of the 45 Jovian Leagues has reported to Jovian headquarters as they are expecting to make their final returns at the close of the campaign on October 31.

The Membership Campaign Committee, of which W. E. Robertson, of Buffalo, N. Y., is chairman, has decided to call the last week of October "Pioneer Member Week" and every effort is being made by this committee as well as the Jovians to secure the largest possible number of members during that time. It is understood that all members who join the Society for Electrical Development before October 31 will be known as "Pioneer Members" and will be so carried on the records of the Society.

Posters printed in red, on card-board, carrying the Society's emblem and slogan, have been sent to all members for display in their offices, show rooms and show windows.

A large number of electrotypes of the Society's emblem and slogan have been sent to members for use on their envelopes, stationery, circulars and in their advertisements. The constant repetition of "Do It Electrically" will undoubtedly have a beneficial effect and result in increased sales of electrical apparatus and supplies. These electrotypes are supplied to members of the Society free of charge and may be obtained in four sizes.

Oregon Copper Production.

The copper production increased in Oregon from 93,136 pounds, valued at $11,642, in 1911, to 260,429 pounds, valued at $42,971, in 1912.

Ten wireless stations are provided for in a contract just signed by the Paraguay Government.

BOOK REVIEW.

"A Handbook of Wireless Telegraphy." By James Erskine-Murray. Fourth edition, revised and enlarged. New York: D. Appleton and Company. Cloth, 442 pages (5½x8¼ inches), illustrated. Supplied by the Electrical Review Publishing Company for $3.00.

Those who are familiar with the previous editions of Dr. Erskine-Murray's valuable book will welcome the appearance of a new edition, which by thorough revision has been brought up to date. Much new material has been added, including a chapter on telegraphic efficiency and data of the new Marconi stations which have recently been completed or are in course of erection. The author has presented a theory of abnormal ranges as well as laying before the reader the ideas of various authorities upon this subject, which it must be admitted is still an open question. It is pleasing to see the emphasis laid by the author upon the distinction between the pure ether waves used by Hertz and the system of practical wireless telegraphy in commercial use today, for outside the ranks of the technical workers, the part taken by the earth in radio transmission is scarcely realized. The design of antenna is gone into at some length and constitutes an interesting chapter. Appendices are given containing the service instructions of the radiotelegraphic convention including the revision of 1912, and the first Marconi specifications for the British imperial chain of wireless stations. The typographical appearance of the volume is excellent and a very good selection of paper has been used. The ability of the author in his field is evidenced by his recent appointment as consulting engineer for the wireless installation between Canada and Great Britain.

Tungsten Ores Discovered.

Ores of tungsten and tin have been discovered practically all over the Tavoy and Mergui districts in Burma, and a large number of concessions are being worked. Wolframite is the main object of exploitation, cassiterite being a sort of by-product, although at times the tin ore forms a larger percentage of the alluvial deposits than the wolframite.

Wireless Telephony Successful.

Wireless telephony has been successfully tried in a South Yorkshire colliery in England. Conversations have been carried out between the pit house and various points in the mine as far as 3,000 feet away.

SPOT WELDING OF PLATINUM POINTS.

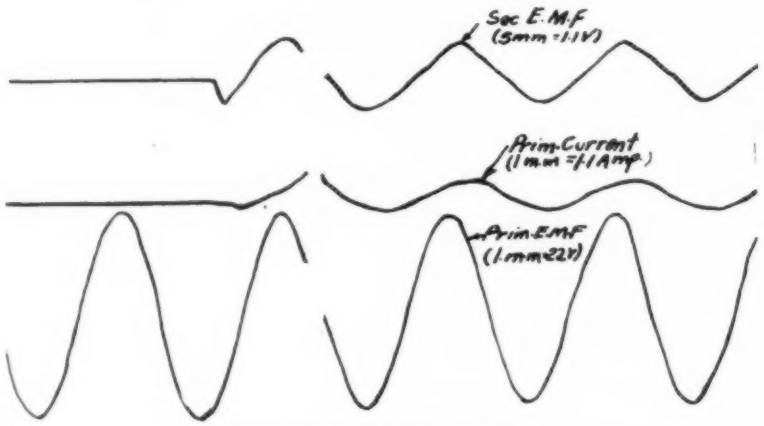
By H. E. Weightman.

Ever since the telephone and telegraph came into existence the use of platinum as a contact point has increased until at present this metal is demanded so much as to make its cost high.

The old method of making a platinum point on a contact spring or armature was to drill or pierce a hole in the piece and press a small piece of platinum into the hole by means of a foot press.

This method was good as far as labor was concerned, but the amount of platinum in the hole of the spring was considerable, even making the hole as shallow as permissible. A new method was started to obviate this trouble, that of welding a thin disk of the metal to the surface of the spring. In welding platinum sheet it was found that a thin coat of copper plate on the platinum next to the spring aided in welding the disk to the spring and reduced the amount of current necessary to effect a weld. A modern welding machine, which is automatic in its action, takes a strip of platinum sheet 0.005 inches thick and 0.115 inches wide, or a coil of platinum wire, depending upon whether a flat contact is to be made or a pointed form. This strip is fed to the clamping device which cuts off the proper sized piece and deposits it upon the spring where it is clamped and a current of electricity sent through it, causing the platinum to weld to the spring. The point is then flattened or pointed, as the case may be, by a die, as it leaves the machine. The labor saved by this method and the increased output per unit of floor space occupied is considerable, but is offset somewhat by the increased cost of power and depreciation of the machine. The principle saving is made in the amount of platinum used per contact.

Fig. 1 is an oscillogram of the current and electromotive force of a welding machine during a weld. It is noticed that the current rises abruptly in the primary on beginning a weld and fluctuates in a smooth wave form after the weld has been completed. It takes about 20 cycles for the transient to die out completely, whereas the transient of the primary electromotive force lasts only 4 or 5 cycles. This oscillogram is not long enough to show a complete dying out of the transients. The curve of the secondary electromotive force shows a peaked wave form. It is to be noticed that, due to the transient current, the electromotive force is higher on the upper half of the wave than the lower half, gradually dying out and becoming even. The primary electromotive force is hardly altered in form, indicating that these machines would produce no bad surges in the line during operation.



Oscillogram of Welding Current.

American Supplies for Brazilian Electric Company.

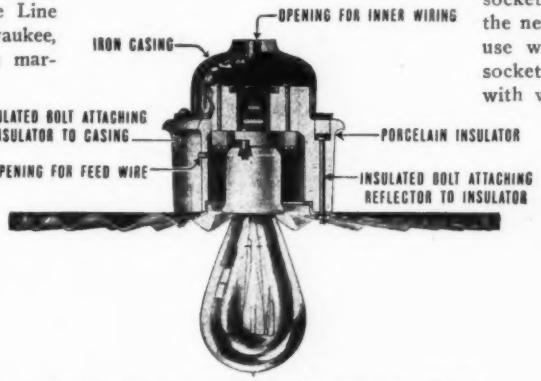
The work of installing a new electric tramway and lighting system in Pernambuco, Brazil, was granted about 18 months ago to Dodsworth & Company, of Rio de Janeiro, a Brazilian company, which has arranged with J. G. White & Company, of New York and London, to do the construction work. The foundation for the power house is now being built and surveys being made for the car barns and track, a portion of which has already been laid. The gauge is one meter. The power machinery and rails are all of American manufacture. Upon the completion of the power plant, which will generate 4,000 horsepower, an opportunity will be afforded for the sale of electrical supplies and apparatus of every description. The work is expected to be completed within one year.

New Electrical and Mechanical Appliances

New Kyle Line Universal Tungsten Fixtures for Series or Multiple Circuits.

The accompanying illustrations show some of the new 5,000 line of outdoor tungsten fixtures developed by the Line Material Company, of South Milwaukee, Wis., and recently placed on the market for the fall lighting business. This universal design is adaptable to any kind of street fixture, can be supported by gooseneck or straight-pipe bracket, by rope or span suspension clamp.

New Universal Tungsten Fixture, Suspension Type.


OPENING FOR INNER WIRING
IRON CASING
INSULATED BOLT ATTACHING INSULATOR TO CASING
PORCELAIN INSULATOR
OPENING FOR FEED WIRE
INSULATED BOLT ATTACHING REFLECTOR TO INSULATOR

Partial Section, Showing Construction of Fixture.

One of the prominent features of this design is the construction of the casing. As will be noted in the cross-section view, the casing consists of a heavy piece of porcelain with an iron top. Because of this heavy porcelain insulating casing, this fixture, without the addition of another insulation, can be used for series circuits or multiple circuits. The construction of the casing allows ample interior space for the socket and provision is made for an inner or outer-wired fixture. For inner-wired fixtures the wires are brought through the iron casing at the top, for others the wires are brought through holes in the porcelain casing provided for the purpose.

Universal Tungsten Fixture, Bracket Type.

The porcelain-enameled fluted reflector is securely bolted to the porcelain casing, which in turn is secured by means of another set of bolts to the top iron casing. The reflectors are furnished in three standard sizes, 18, 20, and 22-inch, being blue on the upper surface and white underneath. The entire fixture is heavy, rigid and substantial, which is especially desirable now because of the extensive use of tungsten lamps for outdoor lighting.

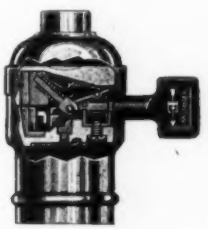
New Type of Subway Car.

The New York Municipal Railway Corporation, which as a subsidiary to the Brooklyn Rapid Transit Company will operate that portion of the new Dual Subway system allotted to that company, has opened for inspection at its shops in Brooklyn a new type of subway car which it is proposed to operate in the new subways.

The new subway car, designed and constructed by the Brooklyn Rapid Transit engineering corps, is the largest and most commodious car of its kind ever built, being 67 feet long and 10 feet wide, with six doors on each side. With all doors in use this car will seat 78 persons, as against 42 to 44 persons in the present subway car. With the center doors in use alone (as possibly in non-rush hours) the car will seat 98 persons.

A New 660-Watt Key Socket.

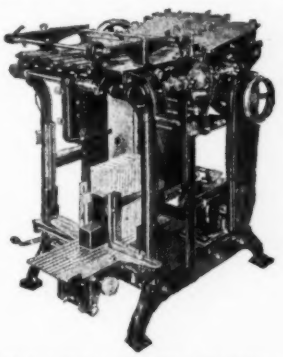
The Arrow Electric Company, of Hartford, Conn., has placed on the market a 660-watt key socket with quick-make-and-break mechanism. The accompanying illustration of a sectional view of the socket shows the mechanism. The rapid development of current-consuming devices has brought about the need of a socket with a greater capacity than the ordinary key socket, and it is to fill this need that the new socket has been designed. Its use will eliminate arcing and other socket troubles now frequently met with when flatirons and other heating devices are connected to ordinary lighting circuits.



Arrow E, 660-Watt Key Socket.

A Rapid Folding Machine.

The folding machine illustrated herewith is interesting because of the number of operations it can perform, its rapidity and the small space it occupies. It can fold paper three times in one operation and can make any of nine styles of parallel folds and three styles of right-angle folds. It can handle stock ranging in size from 18 by 24 inches to 2.5 by 5 inches, and in grade from coated book to onion skin. The folded stock is automatically packed.



Motor-Driven Folding Machine.

The capacity is from 1,500 to 7,000 pieces per hour, or from 8 to 10 times that of a hand folder; the speed is adjustable so as to suit the work being

done. The floor space occupied is only 3 feet by 4 feet. The machine is made by the American Folding Machine Company, Warren, O., and is operated by a one-quarter-horsepower Westinghouse motor.

Electrical Exhibits in Unique South American Display of Chicago Products.

Under the auspices of the Chicago Association of Commerce, there was opened recently at Buenos Aires, Argentina, a permanent exhibition of products made by Chicago manufacturers, about 50 different firms being represented by sample displays of various kinds of merchandise. This is said to be the first permanent exposition of the kind ever undertaken by a local commercial body and it is believed will have a far-reaching effect in the stimulation of trade between the Chicago market and South American buyers in the vicinity of the enterprising capital of the Argentine Republic.

Among the many exhibitors there are, of course, a number of Chicago manufacturers of electrical and kindred lines. Of these the following are worthy of special mention:

Adams & Westlake Company, lamps and other railway supplies.

Benjamin Electric Manufacturing Company, electrical specialties, cluster sockets and various lighting fixtures.

Central Scientific Company, scientific instruments and laboratory supplies.

Wm. Gaertner Company, electrical instruments, scientific apparatus and laboratory equipment.

Mathias Klein & Sons, electricians' and linemen's tools.

National X-Ray Reflector Company, mirrored-glass reflectors for show windows, indirect and direct lighting.

Views of two of these exhibits are reproduced herewith. Of necessity, of course, each exhibit is compact and contains only samples of the principal articles manufactured by the exhibitor. Many of the firms have individual representatives on the ground and others are represented by local agents.

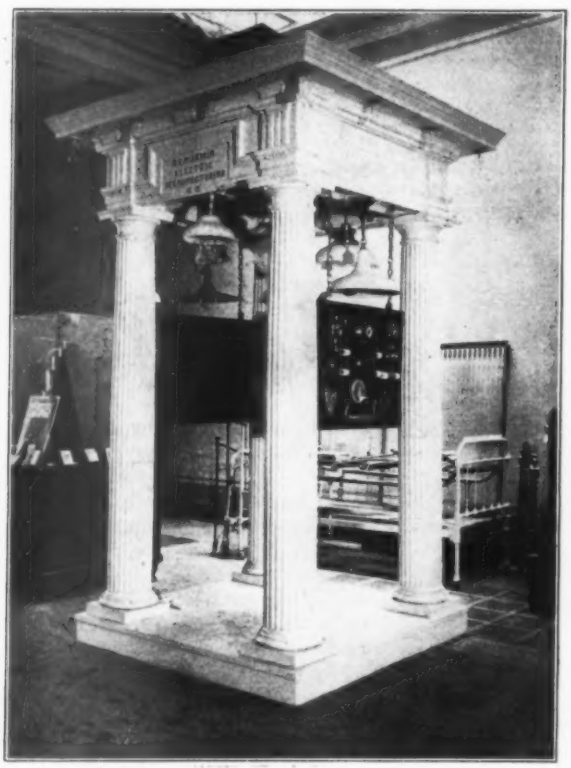


Exhibit of Benjamin Electric Manufacturing Company.

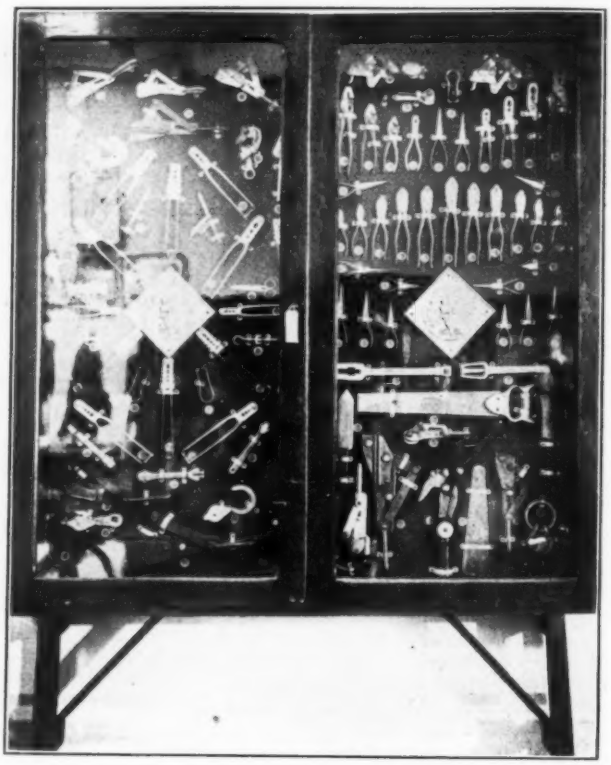


Exhibit of Mathias Klein & Sons.

Increased Adaptability of Porcelain Receptacles.

By a slight modification in the base,

Fig. 1.

Pass & Seymour, Incorporated, Solvay, N. Y., has altered two of its popular porcelain receptacles that are listed as Nos. 61,670 and 61,770, so as to make them adaptable not only for wood

Fig. 2.

molding, as heretofore, but also for use with the pipe tablets that are being so generally used nowadays. Fig. 1 shows the new form of No. 61,670, which is arranged for taking a shade-holder. Fig. 2 shows the modified form of the other receptacle, which is used when no shade-holder is required.

Hart and Hegeman Outing.

The third annual outing of the employees of the Hart & Hegeman Manufacturing Company, Hartford, Conn., was held on Saturday, September 20, at Goodwin Park. Special cars provided transportation from the factory, and upon reaching the park each department assembled under its foreman and a parade was formed. After serving lunch, baseball and field games were conducted, with first and second prizes offered for each event.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

PLAINS, GA.—An electric light plant will be established here. Address the mayor for desired information.

GREAT FALLS, MONT.—An electric light system will be installed here. W. H. Harrison is city engineer. C.

CORPUS CHRISTI, TEX.—Plans for better street lighting are under consideration by the City Council.

BAGLEY, IOWA.—The Council will establish a municipal light plant. Address the city clerk in regard thereto.

CASPER, WYO.—Natrona County Electric Company has received the franchise for electric lights for this city. C.

REDFIELD, IOWA.—Newton & McAllister will build a dam here 110 feet long to furnish power for electric purposes. C.

MADISON LAKE, MINN.—F. B. Knoff and Lewis Fitcher are investigating an electric lighting system for this place. C.

MENOMINEE, MICH. — Cluster lamps will be established on Main Street. Address Guensburg Brothers for particulars.

PRATT, KANS.—Bonds to the amount of $50,000.00 have been voted for the installation of a municipal light plant for the city.

NEW MUNICH, MINN.—Electric light bonds for $5,000 have been voted and an electric light and power plant will be installed. C.

PEABODY, KANS.—The electric light and ice plants here were destroyed by fire. Address the city clerk in regard to the matter.

ALEXANDER, N. D.—D. E. Fuller, H. A. Boe and G. W. Millhouse are looking into the proposition of electric lighting for this place. C.

W. ALEXANDRIA, MINN.—Business men have raised about $3,000 for the installation of a "White Way," requiring 44 lamp posts. C.

NEEPAWA, MAN.—The Council plans to expend $18,000 improving the light and water system. Address F. L. Davis for information.

MISSION, TEX.—A movement is on foot here for the construction of an electric light plant, water works system and sewer system. D.

PORTLAND, ORE.—City Commissioner Daly is planning a complete survey of the city with a view to re-arranging the lighting system. O.

MORRISONVILLE, ILL. — The Southern Illinois Light & Power Company will expend $20,000 this fall improving the station here.

BOKHOMA, OKLA.—The Wilson Lumber Company will install a lighting plant. Address W. M. Waterman, general manager, for information.

HARLAN, KY.—Ira Fields, Jr., is planning to organize a company for the purpose of building an electric light plant at Whitesburg, Ky. G.

COMPTON, CAL.—The City Council is advertising for sale on October 7 the electric light and power franchise recently applied for in this city.

SANDUSKY, O.—A committee has been appointed to secure ways and means to install cluster lighting. Address W. H. Ritter for particulars.

LAFAYETTE, LA.—The City will improve the electric lighting system at a cost of $10,000. Address J. O. Herpin, superintendent, for further particulars.

SEDALIA, MO.—The City Light & Traction Company will erect an addition to the Broadway power house. A 400-horsepower boiler will be installed.

BONDUEL, WIS.—Bonduel Feed & Light Company has been incorporated, capitalized at $10,000, and incorporators are R. C. Wendt, Adolph Spensley, and John Westphal.

DALLAS, TEX.—Plans and specifications are being drawn by the city authorities for the Main Street "White Way," according to M. B. Light, chairman of the movement.

WAYNESTOWN, IND.—All bids for the construction of the electric plant here were rejected. New bids will be asked. Address J. R. Thomas, superintendent, for particulars.

SMITHERS, B. C.—J. L. Hamilton and J. Fraser have formed a partnership and will erect an electric light and water plant here. The work is to be completed this winter. C.

LEBANON JUNCTION, KY.—The Lebanon Junction Light & Power Company has been incorporated with a capital stock of $4,500 by R. M. Hooker, G. W. Bache and others.

COLUMBIA, ALA.—Henry Deal, of Columbia, and R. L. Crawford, of Dothan, Ala., are planning to construct a hydroelectric plant on Omussee Creek at McGriff mill site.

CARROLLTON, MO.—The Water & Light Company has changed ownership and improvements will be made. Address Vivian Ely, manager, in regard to the proposed work.

WAUZEKA, WIS.—Wauzeka Electric Light & Power Company has been incorporated with a capital of $3,000. The incorporators are Frank Kedl, James Tesar, James Willard.

JACKSON, MICH.—The Commonwealth Power Company, will spend $50,000 in improvements in Jackson during this fall and winter. Address the secretary for information.

LOUISVILLE, KY.—The General Construction Company will purchase equipment for an electric light plant to be installed in a large apartment building now under construction. G.

MEDFORD, OKLA.—At an election on September 24 bonds to the amount of $7,000 were authorized for repairing the municipal electric light plant, which was destroyed by fire on August 12.

LOUISVILLE, KY. — National Power Company, of which W. W. Wallace, Birmingham, Ala., is president, will build a $500,000 plant here to manufacture hydroelectric generators.

ALABAMA CITY, ALA.—The City Council has granted a franchise to the Alabama City, Gadsden & Atalla Railroad for an electric lighting system. Address the city clerk for information.

CHICAGO, ILL. — The Monroe Street Improvement Association has been organized for the purpose of making that street as well lighted as any in the loop. Fred L. Rossbach is president.

MENONIMIE, WIS. — Paul E. Hunter and F. McLean have been appointed by the Commercial Club to look up the proposition of a "White Way" lighting system at an estimated cost of $5,000. C.

LOS ANGELES, CAL.—Plans for the extension of the Main Street ornamental lighting system to the city's eastern city limits, a distance of three miles, are now being considered by East Side residents.

MEDICINE HAT, ALTA.—The city engineer is preparing plans and estimates for an addition to the power plant and machinery to furnish 2,500 kilowatts of power. The estimated cost is $250,000. C.

PORTAGE LA PRAIRIE, MAN.—It is proposed to construct a power line from Winnipeg to this town to supply light and power. The estimated cost is $250,000. Address D. Deacon, mayor, for particulars. C.

KELLOGG, IDAHO.—A new system of street lighting will be installed at this place and Wardner by the Bunker Hill & Sullivan Mining Company. A tungsten arc system is planned, at a cost of $4,000. C.

HOUSTON, TEX.—Pharr Electric Light & Power Company has been incorporated with a capital stock of $5,000. The incorporators are A. J. McColl, Jackson, Mo.; S. R. Grawthrop and Marvin Evans, of Pharr.

AUBURN, IND.—By an act of the Common Council it was decided to grant the Fort Wayne & Northwestern Railway Company a franchise to construct, maintain and operate two high-power transmission lines in the city of Auburn.

BANNING, CAL.—The Consolidated Power Company, of which Edwin Moore of Los Angeles, is general manager, has announced its intention of harnessing the waters of the Whitewater River and using it to generate electricity. T.

CONCRETE, WASH.—The Pacific Northwest Traction Company has an-

nounced its intentions of extending its power lines from this city to the Riverside District, for the purpose of furnishing light and power to the residents of that locality. O.

AVALON, CAL.—The Trustees and residents of this city are contemplating the installing of a municipally-owned electric lighting system. The trustees of the city claim that a system of this kind is one of the most urgent necessities of the city. T.

KELSO, WASH.—The Washington-Oregon Corporation, owner of numerous light and power plants, etc., in Washington and Oregon, will immediately begin the construction of a transmission power line between this city and Castle Rock. O.

FREMONT, MICH.—Walter Snow, of Holton, who owns a site on White River in Greenwood township, about six miles from here, will endeavor to secure a franchise from Fremont shortly for the furnishing of the city with electric current for light and power.

WHITTIER, CAL.—The residents of this city are intending to install an ornamental lighting system here. All that now remains to be done is to decide upon the minor details and the contracts. The city clerk of this city should be addressed for details. T.

SIDNEY, B. C.—A contract between the British Columbia Electric Railway Company and the Sidney Board of Trade has been signed by both parties, and provides for the immediate installation of lights on the principal streets of the town for the convenience of the public. O.

PORT MOODY, B. C.—The British Columbia Electric Railway Company has agreed to install 30 100-watt tungsten lamps for street-lighting purposes to extend over a period of 10 years, and in all liklihood this proposition will be taken advantage of by the City Council. O.

LONGVIEW, TEX.—On October 8 bids will be received for constructing a mechanical filtration plant of 1,000,000 gallons capacity, a pumping and electric light plant and a discharge main three and one-half miles long. Address C. A. Bodenheim, mayor, for further information.

CUMBERLAND, MD.—At a recent meeting of the mayor and City Council it was decided to instruct the Commissioner of Water and Electric Light Works to employ some reputable electrical engineer to advise as to the cost and practicability of a municipal lighting plant.

LOS ANGELES, CAL.—At a meeting of the Board of Public Works and Acting Mayor Whiffen, it was decided to appropriate $25,000 per month for three months for the completion of the power house on the Los Angeles Aqueduct and for the transportation of electrical machinery to the site of the power house.

ELLSWORTH, WIS.—The lighting plant of the Ellsworth Heat, Light & Power Company has been sold to the Chippewa Valley Railway Light & Power Company. A line will be built from here to Hartland, which will connect with the Menominee-Red Wing line. Right of way has already been purchased. C.

MAXWELL, IOWA.—C. E. Lookingbill and W. C. Enfield, of the Maxwell Light & Power Company, to whom a franchise has been granted, will soon begin the erection of an up-to-date generating plant. They have applied for a franchise at Collins, and if it is granted a transmission line will be built from here. C.

CUMBERLAND, MD.—The Magnolia Power Company proposes to construct a hydroelectric plant developing 13,000 horsepower on the south branch of the Potomac at Springfield, W. Va. The cost will be $1,000,000. It is proposed to transmit electricity to Cumberland, Springfield and Romney and points in West Virginia.

ELY, NEV.—The Hamilton Power, Mining & Transportation Company, of Hamilton, is preparing to put in a power plant on Illipah Creek 30 miles west of this place to develop 340 horsepower of electric current to be distributed throughout the Hamliton and White Pine mining districts. The plant is expected to cost about $30,000.

KENO, ORE.—State Engineer Lewis announces that preliminary surveys for a great water-power project below Keno have been completed. The surveys were conducted with the cooperation of the state of Oregon and the Federal Government. A canal 10:5 miles long will be built and approximately 100,000 gross electric horsepower developed.

LEWISTON, MONT.—With the paving of the business district, now in progress, there will shortly be installed a new lighting system covering the paved districts, which will require additional lights. Max Hebgen, head of the local electric company recently announced that he was preparing a new schedule of rates which will provide for a general reduction. O.

PITTSBURGH, PA.—The Broad Electric Company, of Pittsburgh, recently incorporated under the laws of Delaware with a capital of $100,000, is preparing to operate a plant in Pittsburgh. The company will manufacture a new kind of electric flash lamp and other electrical appliances. It will soon be in the market for the necessary machinery and equipment. Isaac F. Piersel is president.

MONONA, IOWA.—L. A. Wellman & Sons have accepted plans and specifications covering the city distribution system, proposed for furnishing power and light for the people of Monona. This system includes a substation in which will be placed all apparatus and equipment necessary to step down the current from the 13,500 volts. A transmission line will be built by the McGregor Light & Power Company, from McGregor. Details of this installation may be obtained from W. H. Grover, engineer, Ames, Iowa.

REDDING, CAL.—An application from the Pitt River Power Company for a franchise to erect poles and string wires on the highways of Shasta County has been filed with the Board of Supervisors. The company proposes to furnish light and power in eastern Shasta County. Power for irrigation in Fall River and Burney valley are among the purposes of the company. It has fine power facilities on the streams of eastern Shasta, having an abundance of water and good fall, enabling the company to develop a large quantity of electrical force. San Francisco capital is behind the proposition, and it is reported that an abundance of money is available.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

MIAMI, FLA.—The Miami Telephone Company will install conduits for its main wires in the principal streets.

HARRISON, ARK.—The Boone County Telephone Company has purchased a site and will erect a telephone exchange.

TOPEKA, KANS.—An agitation has been started to install a telephone system in the school buildings. Address the secretary of the School Board.

PORT ANGELES, WASH.—President C. J. Farmer, of the local telephone company, announces the construction of new offices and exchange, and the installation of a new system of cables. O.

PORTLAND, ORE.—The Pacific Telephone & Telegraph Company has authorized expenditures aggregating $150,000 for betterments to the system in Portland and in the immediate vicinity.

BIRMINGHAM, ALA.—The Southern Bell Telephone & Telegraph Company will make further improvements in its equipment to cost $50,000. Address F. F. Turnbull, manager, for particulars.

ILLIOPOLIS, ILL.—The Illiopolis Telephone Company has been incorporated with a capital stock of $16,000 to operate telephone lines, exchanges, etc. The incorporators are C. B. Cheadle, M. L. Chaw, and others.

SIGEL, ILL.—The Sigel Mutual Telephone Company has been incorporated with a capital of $5,000 to operate a mutual telephone system. The incorporators are Charles V. Chappelear, Henry Imming, A. W. Bigler.

FLAGSTAFF, ARIZ.—The Western Union Telegraph Company has appropriated $5,000 for the installation of new equipment for its office in this city. The installation will begin at once and will be completed in about six months.

LINDSAY, MONT.—The Farmers Mutual Telephone Company, of this city, recently filed articles of incorporation, with a capitalization of $20,000. Among the incorporators are W. C. Fellows, Dr. P. J. Moe and C. F. Rainey, all of this city.

REGAN, N. D.—The farmers between Regan and Alta are to have a telephone line connecting with the central here. At a mass meeting a company was organized with N. Blexrud, president, and John Anderson, secretary. Construction work will be started so the line can be completed this fall.

CLIFTON, ARIZ.—R. E. Pillous, district manager of the Mountain States Telephone Company, with headquarters at Deming, N. M., states that the company will soon undertake the entire renovation of the system at Clifton. The present equipment will be entirely replaced with new. The lines between Clifton and Morenci and Clifton and Duncan will be replaced.

SOUTH PASADENA, CAL.—The Home Telephone Corporation, which serves this city, has just been granted a franchise to conduct a telephone business in this city for a period of 40 years. In view of this fact the company has decided to make many improvements. A new central station has been erected and this will be equipped in the most modern manner. A trunk line will be run from this city to Los Angeles, each strand of cable to contain 60 wires, and many other improvements are planned. T.

ELECTRIC RAILWAYS.

(Special Correspondence.)

MILES CITY, MONT.—An electric line will be built from Baker to Ismay. J. E. Pringle is interested. C.

NEENAH, WIS.—Eastern Wisconsin Electric Railroad Company is obtaining franchises near this city for a new line. C.

AKRON, O.—An ordinance is being considered by the Council authorizing an issue of $225,000 municipal street railway bonds. Address the city auditor.

MILWAUKEE, WIS.—Residents of Evergreen Park have organized a company known as the Milwaukee Traction Company and propose to build a line to the park. C.

HILLSBORO, ILL.—The Hillsboro Electric Light & Power Company is planning to double track its Hillsboro Street line. J. J. Frey is president and general manager.

HELENA, MONT.—The Commercial Club is formulating tentative plans for the building of an electric road from here to Hauser Lake. Harry G. Pickett is president. C.

QUINCY, ILL.—The Wisconsin Electric Railway Company is securing right of way from Oshkosh to Neenah for its proposed electric railway. J. P. Pullman is general manager.

ROCHESTER, MINN.—Plans are being made for the extension of the St. Paul Southern Electric Railway from Rochester, Minn., to Decorah, Iowa. The estimated cost of construction is $30,000 a mile.

VALLEJO, CAL.—Oakland capitalists have been interested in the proposal to construct an electric railroad between this city and Benicia, and efforts are now being made to investigate the matter thoroughly.

RED LODGE, MONT.—Members of the local Commercial Club have formed a company and incorporated as the Red Lodge Electric Railway Company, and will build a line to Bear Creek, nine miles. Work is to begin this fall. C.

VISALIA, CAL.—The Board of Trustees of this city will offer for sale to the highest bidder the electric railway franchise recently applied for by the Big Four Electric Railway Company. A 50-year franchise has been framed.

GALLIPOLIS, O.—The Gallipolis & Northern Traction Company has been incorporated with a capitalization of $50,000. T. W. Jackson, C. R. Cunningham, H. Marsh, H. L. Lambert, J. V. Lee, C. W. Kerr and E. M. McCormick are the incorporators.

DETROIT, MICH.—The Detroit United Railway Company has been granted a franchise by the City Council to construct a crosstown line on the West Side and extend its Kercheval Avenue line. F. W. Brooks, of Detroit, is general manager of the company.

BRAINERD, MINN.—George Reid, president of the Minnesota Central Railway Company, has been given a franchise for an electric railway here. This railway will form part of an electrical passenger and freight railway covering the Cuyuna iron range about 40 miles long. C.

SUPERIOR, WIS.—Talk of building the "Arrow Line" is being revived, and hopes are refreshed for a direct electric line between the Twin Ports and the Twin Cities. Information is to the effect that the proposed line will be constructed according to the original plans. C.

NEW ALBANY, IND.—The New Albany & French Lick Valley Interurban Railroad Company has been organized to build an electric line between New Albany and French Lick and West Baden Springs. The capital stock is $100,000. John H. Martin, of Palmyra, is president.

MINNEAPOLIS, MINN.—The City Council has ordered the construction of a municipal street car line to be built from Thirty-seventh Avenue northeast to the filtration plant. Work is to be begun immediately, and the cost is estimated at $26,000. Address the city clerk in regard to the matter.

FRESNO, CAL.—If a bonus of $40,000 can be raised and rights of way secured, one-half of which has already been accomplished, an interurban line from this city to Clovis will be financed and built by Mahoney Brothers of San Francisco. The line will call for an investment of about $300,000.

BEAUMONT, CAL.—The members of the Board of Trade of this city have just made an application to the supervisors of Riverside County, asking that body to support their plan to build that part of the proposed Redlands-Beaumont electric road lying inside Riverside County. It is believed that the Supervisors are favorably inclined toward this proposition. T.

NEW HAVEN, CONN.—Certificate of organization has been filed by the Mt. Carmel Railway Company, which is to build either a cog or cable road from the tracks of the Connecticut Company's trolley line to the top of Mt. Carmel, which it is proposed to convert into a summer resort. The directors named are Willis M. Cooke, C. F. Clarke and Sereno P. Cooke. The capital stock is $75,000.

LOS ANGELES, CAL.—The Board of Public Works has unanimously recommended the granting of a 40-year franchise to the Pacific Electric Railway Company for an elevated electric railway connecting the company's Main Street station with its new San Pedro line. The construction work is estimated to cost $500,000. Contracts for the steel will be let immediately on the granting of the franchise.

HOUSTON, TEX.—In order to provide for needed extensions and improvements the Galveston-Houston Electric Company will increase its common stock to $5,000,000 and its preferred stock to $4,000,000. It is planned to install new electric equipment in the power station, extend the street railway systems of the company in Houston and Galveston and to construct branch lines of the interurban electric road that connects Houston and Galveston. D.

AUSTIN, TEX.—The Dallas-Southwestern Traction Company has filed articles of incorporation, capitalized at $500,000. The purpose of the corporation is the construction, acquiring, maintaining and operation of lines of interurban railways within and between the cities of Dallas and Glen Rose, with a branch line from Eagle Ford to Irving, to be operated by electric, or other motive power, and to produce and sell electric lights and power service to the public and to municipalities. Construction work will soon be started.

FINANCIAL NOTES.

In their estimate of dividend disbursements for October, Dow, Jones & Company state that electric railways having a total capitalization of $372,900,710 will distribute $6,084,000 in dividends and street railways with combined bonded debt of $356,734,000 will pay out $8,950,877 in interest.

An assessment of $5 a share is to be made on the stock of the Philadelphia Electric Company between now and January 1, according to a director of the company. At the same time a special dividend of $1.50 per share is to be declared out of surplus, applicable to the assessment, thus reducing the payment by the stockholders to $3.50. If this program is carried out it will make the stock $22.50 paid in on a par value of $25 and will give the company $3,500,000 ready cash with which to carry out an extensive program of power house construction. Negotiations are under way with the Pennsylvania Railroad for the power contract in connection with the electrification of the railroad's main line and Chestnut Hill suburban service. If the electric company secures this contract it will need large additional power facilities by a year hence. Owing to the new public utilities law becoming effective in this state on January 1, the management is anxious to get its financial arrangements completed before that time. The company on December 31, 1912, had a surplus of $1,787,913. By the end of this year this will be increased to about $2,500,000, out of which a special dividend of $1.50 per share would take $1,500,000.

The annual meeting of the Manhattan Railway Company will be held November 12. Books close October 11 and reopen November 13.

New York bankers have purchased $4,500,000 Bell Telephone of Canada five-per-cent bonds, due April 1, 1925.

Montreal Tramway Company has applied to the New York Stock Exchange to list $13,335,000 first and refunding-mortgage, thirty-year, five-per-cent coupon bonds, series A, due 1941.

At a special meeting of the United Gas & Electric Corporation stockholders, an issue of $12,500,000 second-preferred stock was authorized.

The construction outlays of the Bell system during 1913 will aggregate between $60,000,000 and $62,000,000, according to estimates based on actual outlays for the first eight months of the year. This closely conforms to the original estimates which the management made just prior to the close of 1912.

The Western United Gas & Electric Company, operating in Illinois, and in which the American Gas Company, of Philadelphia, is a large stockholder, has sold to western bankers $1,000,000 six-per-cent general-mortgage bonds which are being offered on a five-per-cent basis.

Interborough Rapid Transit Company for August showed gross earnings of $2,348,789, an increase of $15,627. The surplus for the month was $274,610, an increase of $54,156. The number of passengers carried was 45,702,014, an increase of 375,096.

The California Railroad Commission has formally approved the request of the Western State Gas & Electric Company to issue $354,000 additional bonds, to mature in 30 years, bearing interest at the rate of five per cent. The Western States Company is a subsidiary of the Standard Gas & Electric Company. The proceeds

of bonds will pay for improvements and additions already made.

There has been filed a $1,000,000 mortgage upon the property of the Washington-Oregon Corporation in the state of Washington, the mortgage covering the Centralia-Chehalis interurban line and the numerous water and power plants owned by the company throughout southwest Washington. It is understood that $400,000 of the mortgage will be used to retire outstanding bonds, while the remainder will be expended on the extension of the company's electric line from Centralia to Olympia.

Announcement has been made by the United Light & Railways Company that the old second-preferred stock of the company, issued October 1, 1910, amounting to $600,000, will be convertible into either six-per-cent first-preferred or into common stock, share for share, on October 1. If a stockholder does not exercise the privilege to convert his stock within sixty days of that date the company will deliver him either first-preferred or common stock, as it deems advisable.

Daniel G. Reid, E. T. Marston, T. De Witt Cuyler and E. R. Bacon were elected directors of the Interborough Rapid Transit Company at the annual meeting of shareholders, to succeed G. L. Hoyt, John Pierce, G. W. Young and one vacancy. President T. P. Shonts stated after the meeting that the new directors of the Interborough represented substantial interests in the property, but that there was no other significance in their election.

At a special meeting of the stockholders of the United Gas & Electric Corporation an issue of $12,500,000 second-preferred stock of the company was authorized, the new stock to bear two-per-cent dividends in 1914, three per cent in 1915, four per cent in 1916, five per cent in 1917 and six per cent thereafter. The new stock is to be used in the acquisition of the common stock of the Americn Cities Company, $75 of new second-preferred and $25 common stock of United Gas & Electric Corporation to be exchanged for each $100 par value of American Cities stock. It is understood that a large amount of American Cities common stock has already been deposited under the terms of the exchange.

Commonwealth Edison stockholders approved the consolidation of the Cosmopolitan Electric and the increase in Commonwealth's capital stock of $10,000,000, and a 10-per-cent stock dividend out of surplus, as per directors' recommendation. The increase in the capitalization of the Commonwealth Edison of $10,000,000 makes its total authorized stock capitalization $50,000,000. Of the new stock, $4,000,000 will be distributed to present holders of Commonwealth Edison as a 10-per-cent stock dividend. It is understood that in December of this year the remainder of the new stock will be sold to stockholders of the company at par. As all matters in connection with the acquisition of the stock of the Cosmopolitan Electric were settled some time ago, the taking over of this company will not require any issue of stocks or bonds or the payment of anything beyond a nominal consideration for the Cosmopolitan Electric stock.

Dividends.

American Power & Light Company; quarterly of 1.5 per cent on preferred, payable October 1 to stock of record September 25.

Auburn & Syracuse Electric Railroad Company; a quarterly preferred dividend of 1.5 per cent payable October 15.

Bell Telephone of Pennsylvania; quarterly of 1.5 per cent, payable October 15 to stock of record October 4.

Boston Suburban Electric Companies; quarterly of one per cent on preferred, payable October 15 to stock of record October 1.

Buffalo General Electric Company; a quarterly dividend of one per cent, payable September 30.

Central & South American Telegraph Company; quarterly of 1.5 per cent on preferred, payable October 8 to stock of record September 30.

Chicago Suburban Gas & Electric Company; 1.5 per cent on preferred, payable October 1 to stock of record September 20.

Chippewa Valley Railway, Light & Power Company; a quarterly common dividend of two per cent, payable October 1.

Consumers Power Company (of Michigan); the regular quarterly dividend of 1.5 per cent on the preferred stock, payable October 1 to stock of record September 19.

Columbia (S. C.) Railway, Gas & Electric Company; a quarterly dividend of 1.5 per cent, payable October 1.

Continental Gas & Electric Corporation; regular quarterly of 1.5 per cent on preferred and 0.5 per cent on common, payable October 1 to stock of record September 23.

Edison Electric Illuminating Company; a semi-annual dividend of $4 per share, payable November 1.

Honolulu Rapid Transit & Land Company; a quarterly dividend of two per cent, payable September 30.

Illinois Traction System, a quarterly dividend of 1.5 per cent, payable October 1.

Manchester Traction, Light & Power Company; a quarterly dividend of two per cent, payable October 15.

Marconi Wireless Telegraph, Ltd., 10 per cent on common, payable October 1.

Mexican Telegraph Company; quarterly of 2.5 per cent, payable October 15 to stock of record September 30.

Michigan State Telephone Company; a quarterly preferred dividend of 1.2 per cent, and a common dividend of 1.5 per cent, both payable September 30.

Nashville Railway & Light Company; a quarterly preferred dividend of 1.25 per cent, payable October 1.

National Light, Heat & Power Company; a quarterly preferred dividend of 1.25 per cent, payable October 1.

Scioto Valley Traction Company; quarterly of 1.25 per cent on the first and second preferred stocks, payable October 1.

Southern California Edison Company; quarterly of $1.25 on preferred, payable October 15 to stock of record September 30.

Southern New England Telephone Company; a quarterly dividend of 1.75 per cent, payable October 15.

United Railways & Electric Company; the regular quarterly dividend of one per cent, payable October 15 to stockholders of record October 4.

Virginia Railway & Power Company; regular semiannual of $1.50 on the common stock, payable October 20 to stock of record October 6.

West India Electric Company, Ltd.; quarterly of 1.25 per cent, payable October 1 to stock of record September 23.

West Penn Traction Company; a quarterly preferred dividend of 1.5 per cent, payable October 15.

Western Ohio Railway; quarterly of 1.75 per cent on first-preferred, payable October 1, and 1.5 per cent on second preferred, payable October 10.

Westinghouse Electric & Manufacturing Company; regular quarterly of 1.75 per cent on preferred and one per cent on common; the preferred payable October 15 and the common October 30 to stock of record September 30

Winnipeg Electric Railway Company; a quarterly dividend of three per cent, payable October 1.

Reports of Earnings.

TEXAS POWER & LIGHT.

	1913	1912
August gross	$ 92,030	$ 83,456
Net after taxes	33,424	33,299
Surplus after charges	12,748	22,616
Twelve months' gross	1,064,897	920,386
Net after taxes	403,137	389,043
Surplus after charges	233,260	297,338

CITIES SERVICE.

	1913	1912
August gross	$ 137,137	$ 83,790
Net	112,201	78,525
Preferred dividends	63,539	50,963
Common dividends	33,559	18,311
Surplus	15,102	9,250
Twelve months' gross	1,540,691	1,132,528
Net	1,428,533	1,053,325
Preferred dividends	711,880	579,251
Surplus	375,051	279,235

Accumulated surplus to August 31, 1913, $856,328.

NEW YORK RAILWAYS.

	1913	1912
July gross	$1,174,464	$1,150,986
Net after taxes	346,203	329,416
Other income	27,259	35,106
Total income	373,462	364,522
Interest on underlying bonds	224,490	225,448
Increase available for interest on company's bonds	148,971	139,074
Interest on ref. 4s	54,320	54,331
Net income	94,651	84,743
Passengers carried	23,117,539	22,200,802

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Sept. 29.	Sept. 22.
American Tel. & Tel. (New York)	131½	131½
Commonwealth Edison (Chicago)	153⅛	148½
Edison Electric Illuminating (Boston)	269	270
Electric Storage Battery common (Philadelphia)	49¼	51¼
Electric Storage Battery preferred (Philadelphia)	49¼	51¼
General Electric (New York)	146⅛	147
Kings County Electric (New York)	119	119
Manhattan Transit (New York)	1⅜	1½
Massachusetts Electric common (Boston)	13¾	14
Massachusetts Electric preferred stamped (Boston)	67	68
National Carbon common (Chicago)	116	118
National Carbon preferred (Chicago)	115	113
New England Telephone (Boston)	146½	145¼
Philadelphia Electric (Philadelphia)	23	23⅛
Postal Telegraph and Cables common (New York)	79½	80
Postal Telegraph and Cables preferred (New York)	67	66½
Western Union (New York)	68½	69
Westinghouse common (New York)	70½	70⅝
Westinghouse preferred (New York)	108	115

PERSONAL MENTION.

MR. HUGH J. PRITCHARD, formerly associated with Tucker, Anthony & Company, has been elected treasurer of the United Gas & Electric Corporation.

DR. GANO DUNN, president of the J. G. White Engineering Corporation, has been elected a member of the Simplified Spelling Board. Dr. Dunn was previously a member of the Advisory Council of the Board.

MR. O. C. ROSS, who for many years prior to 1912 was connected with the Cincinnati office of Allis-Chalmers Company, has been placed in charge of the newly established district office of Allis-Chalmers Manufacturing Company in the Traction Terminal Building, Indianapolis, Ind.

MR. W. H. ROLINSON, who has been for some years chief lamp inspector of the Electrical Testing Laboratories, New York, has resigned this position for the purpose of accepting a position as commercial engineer with the Westinghouse Lamp Company.

MR. FRANK S. PRITCHARD, formerly with the United States Graphite Company, has become associated with the Dearborn Chemical Company at Cincinnati, as assistant to MR. DAN DELANEY, who for many years was manager of the Dearborn Chemical Company's office at Cincinnati.

MR. HENRY L. HORNBERGER has returned to the Pacific Coast, and will open an automobile warehouse and salesroom at San Francisco, Cal. He will have the distribution of Borland-Grannis electric cars, and a number of gasoline cars, in the states of California, Oregon, Washington, Idaho, Nevada and Arizona, and in British Columbia.

MR. P. E. COWLES, manager of the electric light plant in Kenosha, Wis., has been transferred by the Milwaukee Electric Railway & Light Company to Racine, where he will have charge of the electrical department of the Racine plant. Mr. Cowles succeeds MR. WEISS, who has resigned, and is himself succeeded in Kenosha by MR. G. H. COOK, of Milwaukee.

MR. STANLEY H. MOSHER, for several years manager of the McCasky property at Leitchfield, Ky., which is operated as the Leitchfield Light, Heat & Power Company, has been transferred to Petersburg, Ind., where the same interests are in charge of the electric light and other public service properties. His successor at Leitchfield will take hold shortly.

MR. HOWARD ELLIOTT has been elected president of the New England Navigation Company, New England Steamship Company, Connecticut Company, New York & Stamford Railway Company and Housatonic Power Company, and was also made a director of the Millbrook Company and the New York, Westchester & Boston Railway. Mr. Elliott will later be made chairman of the Board of the Connecticut Company and the steamship companies.

MR. A. R. KNIGHT, who has been appointed instructor in electrical engineering at the University of Illinois, graduated from Ohio State University with the degree of Mechanical Engineer in Electrical Engineering in 1909; was engaged in practical work with the Columbus Public Service Company and the Dayton Lighting Company, 1906-08; was inspector of construction and chief electrician with the Springfield Light, Heat & Power Company, Springfield, Ohio, 1909-11; and since 1911 has been instructor in electrical engineering at the University of Pennsylvania.

MR. C. C. BRADFORD, formerly manager of the Cleveland branch office of The United States Light & Heating Company, has been appointed sales manager of that company, with offices at 30 Church Street, New York City. Mr. Bradford became identified with the company in 1909. After one year as manager of the New York branch office, he went to Cleveland for the purpose of establishing a branch office in that city. His appointment as sales manager comes after three highly successful years as manager of the

C. C. Bradford.

Cleveland office. MR. R. B. CLARK has been appointed acting manager of the Cleveland branch office.

MR. VERNE W. SHEAR has established an office as commercial engineer and manufacturer's agent at the Flatiron Building, Akron, Ohio, representing the Condit Electrical Manufacturing Company, Pittsburgh Transformer Company, and several other manufacturers. Mr. Shear is a graduate of Case School of Applied Science, a member of the American Institute of Electrical Engineers. He was connected with the Westinghouse Electric & Manufacturing Company as commercial engineer, and for the last 18 months has been electrical engineer of the Northern Ohio Light & Traction Company, with headquarters at Akron.

MR. P. S. BIEGLER, who has been appointed associate professor of electrical engineering at the University of Illinois, graduated from the University of Wisconsin with the degree of Bachelor of Science in Electrical Engineering in 1905; is a member of the honorary society of Tau Beta Pi, was for two years with the Commonwealth Edison Company, Chicago, Ill., in the testing and engineering departments; was instructor and later assistant professor of electrical engineering at the University of Iowa, 1906-09; Assistant to the electrical engineer of the Washington Water Power Company 1909-10; assistant professor of electrical engineering at Purdue University, 1910-11; and since 1911 has been assistant professor and later professor of electrical engineering at the University of Montana.

NEW INCORPORATIONS.

UNION CITY, O.—The Union City Ohio Electric Company has been incorporated with a capital stock of $5,000 by Harry W. Isenberg and others.

LOGAN, W. VA.—Pioneer Gas & Electric Company has been incorporated to deal in gas and electric fixtures. The capital stock is $5,000 and the incorporators are C. W. Beckner, Huntington, W. Va.; G. W. Raike, C. W. Poling, W. E. Lanham and D. A. Daniels, of Logan, W. Va.

NEW YORK, N. Y.—D. S. Holcomb & Company, Incorporated, has been incorporated for the purpose of manufacturing and selling electric motors. The capital stock is $15,000 and the incorporators are David S. Holcomb, Brooklyn, N. Y.; William S. Holcomb, New York City; and John Magnuson, Brooklyn, N. Y.

PROVIDENCE, R. I.—The Grant Vacuum & Sales Agency, incoroprated, took out articles of incorporation to do business in this city in vacuum cleaning and selling electrical devices for that work. The corporation is made up of Irving A. Salisbury, Arthur C. Jenney, Susie A. Grant and Horace M. Grant, and its capital stock is $10,000.

PROPOSALS.

SWITCHBOARDS.—Sealed proposals will be received at the Engineer Depot, United States Army, Washington, D. C., until October 8 for furnishing 13 direct-current switchboards, etc. Further information may be obtained from Joseph E. Kuhn, lieutenant colonel, corps of engineers, U. S. Army.

ELECTRIC ELEVATOR.—Sealed proposals will be received at the office of the Coast and Geodetic Survey, Washington, D. C., until October 11 for an electric freight elevator in the Richards' Building, in accordance with the specifications, copies of which may be obtained from the superintendent, Coast and Geodetic Survey.

ELECTRIC-LIGHT WIRING, TELEPHONE SYSTEM AND PROGRAM CLOCK SYSTEM. Bids will be received by J. S. Woodward, secretary of the Board of Education, Rapid City, S. D., until October 11 for the installation of an electric-light wiring, telephone system and program clock system in the High School building. C.

SWITCHBOARD.—Bids will be received at Room 406, City Hall, Chicago, Ill., until October 3 for furnishing, delivering and erecting one four-panel switchboard complete with connections, accessories and appurtenances at the Fourteenth Street pumping station. Address L. E. McGann, Commissioner of Public Works.

ELECTRIC CONDUIT AND WIRING AND INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until November 1 for furnishing the electric conduit and wiring and interior lighting fixtures in the present assay office at Charlotte, N. C.; and until November 7 the same for a one-story building for the post office at Monroe, S. C., in accordance with drawings and specifications, copies of which may be obtained from the custodians of the sites or the office of the Supervising Architect.

NEW PUBLICATIONS.

STEAM.—The thirty-fifth edition of "Steam, Its Generation and Use" has been published by the Babcock & Wilcox Company, New York City. This publication has steadily grown in size and adds each year more material of interest to the user of steam. The present edition contains 335 pages and is well illustrated.

IRON ORES.—The United States Bureau of Mines has issued Bulletin 64, entitled "The Titaniferous Iron Ores in the United States," by Joseph T. Singewald, Jr. This bulletin discusses the occurence, composition and economic value of ores of this class. The bulletin is well illustrated with microphotographs of the various ores.

TELEPHONE PAPERS.—Three addresses by Emile Berliner have been published in pamphlet form. These are "The Loose-Contact Transmitter," delivered before the Telephone Society of Washington; "A Reminiscence," delivered before the Telephone Pioneers of America, and "The Development of the Talking Machine," delivered before the Franklin Institute.

NEW YORK COMMISSION REPORT.—The sixth annual report of the Public Service Commission for the Second District, State of New York, Vols. I and II, for the year 1912, has come from the press. Vol. I contains in addition to the orders of the Commission, financial reports of electrical and gas companies and a summary of the work of the Commission. Vol. II contains abstracts of reports of steam railroad, electric railroad, express and sleeping car companies, and the individual reports of the investigations of steam railroads.

ENGINEERING EDUCATION.—Part 2 of Vol. XX of the *Proceedings* of the Society for the Promotion of Engineering Education has come from the press. This contains the papers and discussions presented at the 1912 convention at Boston, Mass., relating to engineering laboratories and engineering courses. Among these are the articles by W. T. Magruder giving the results of a tour of investigation of engineering laboratories; by R. R. Heuter, giving a detailed description of the laboratories at Charlottenberg, Germany; by Horace Judd, describing the equipment of the new Robinson laboratory at Ohio State University; and by W. S. Franklin and Barry MacNutt on the teaching of elementary physics. The volume also contains statistics of the Society. It is sold to non-members at $1.25 per copy and can be obtained from the secretary, Henry H. Norris, Ithaca, N. Y.

DATES AHEAD.

Colorado Electrical and Industrial Exposition, Auditorium, Denver, Colo., October 4-11.

Colorado Electric Light, Power and Railway Association. Eleventh annual convention, Denver, Colo., October 6.

Colorado Electrical Club Show. Denver, Colo., October 8-15.

Kansas Gas, Water, Electric Light and Street Railway Association. Annual convention, Hutchinson, Kans., October 9-11.

American Electric Railway Association. Annual convention, Atlantic City, N. J., October 13-17.

Jovian Order. Annual convention, Hotel Astor, New York, N. Y., October 14-16.

Railway Signal Association. Annual convention, Nashville, Tenn., October 14-17.

Telephone Pioneers of America. Annual meeting, Chicago, Ill., October 16-17.

Electrical Exposition and Motor Show of 1913. New Grand Central Palace, New York, N. Y., October 15-25.

American Mining Congress. First national mining show. Horticultural Hall, Philadelphia, Pa., October 17-25.

Association of Railway Electrical Engineers Annual convention, Hotel La Salle, Chicago, Ill. October 20-24.

Electric Vehicle Association of America. Annual convention, Hotel La Salle, Chicago, Ill., October 27-28.

Ohio Society of Mechanical, Electrical and Steam Engineers. Annual meeting, Columbus, O., November 20-22.

With the Electrical Manufacturers

Tregoning Electric Manufacturing Company, Cleveland, O., has sent out copies of bulletin No. 5 which lists a number of the company's new attachment plugs, rosettes, receptacles, stage connectors and shade-holders.

Naugle Pole & Tie Company, 5 South Wabash Avenue, Chicago, is sending out folders calling attention to the rapid depletion of cedar-pole stocks suitable for telephone and other electric overhead lines. Therefore, it suggests that pole orders be placed early before prices go up and bad weather sets in.

The Yost Electric Manufacturing Co., Toledo, O., has issued a little folder describing and illustrating the Yost Lockfast attachment plug. This plug is of simple and rugged construction; it is easily wired and very readily applied, since its insertion with a slight turn to the right connects it instantly to any socket or outlet.

Holcomb & Hoke Manufacturing Company, Indianapolis, Ind., made the only exhibit at the recent convention of the Indiana Electric Light Association. This exhibit comprised samples of the company's new induction meter and parts thereof. Mr. Scheefer, the inventor of this meter, and other representatives of the company, explained its construction and advantages.

Flush Plate & Appliance Company, Incorporated, Binghamton, N. Y., is sending out cards illustrating the use of its "On-Quik" supporting plate. This is a very convenient device for securing switch boxes to the wall and can be used as well in new as in old work. The Blanding Electrical Supply Company, of Binghamton, has a large supply of these plates in stock for contractors.

Hartford Time Switch Company, Mattlage Building, New York City, is sending out a folder showing the simple internal mechanism of its time switch. These are dustproof and weatherproof and require winding only once a week. The switches are suitable for the automatic control of various circuits, such as window lights, electric signs, railroad-station lights, apartment-house hall lights, storage-battery charging circuits, etc.

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., announces the removal of the sales and engineering offices of its Mining-Machinery Department from Chicago to the Milwaukee works at West Allis; this change will take place on or shortly before October 6. It is planned to also remove the two Chicago shops to Milwaukee in the near future. The advantages to be gained by concentrating all of the company's departments, both commercial and manufacturing, at one plant are the reasons for this move.

De La Vergne Machine Company, New York City, has issued bulletin No. 132 which describes the type FH single-cylinder De La Vergne oil engine. This 16-page bulletin is copiously illustrated with diagrams and views of these engines and parts thereof, also typical installations of the engines and views in the De La Vergne Works showing engines in various stages of construction. Indicator diagrams showing the excellent characteristics of these engines are also shown. The bulletin contains a good description of the machines and tests and other data.

Multi Refillable Fuse Company, 817 Washington Boulevard, Chicago, has recently been started by C. T. McDonald for the manufacture of refillable fuses. Mr. McDonald was formerly connected with the Underwriters' Laboratories and later was engaged in the fuse business for eight or nine years. The company is manufacturing a complete line of old and new Code forms of fuses of the refillable type and is also in a position to make special fuses to meet any requirements. The company desires agents in every industrial center. Catalog No. 1 will be mailed on request to those interested in refillable fuses.

The Pittsburgh High Voltage Insulator Company, Derry, Pa., has issued catalog No. 3. This publication covers 159 pages, on 140 of which are shown dimension diagrams of the numerous types of high-tension porcelain insulators made by the company. In each case the leakage and striking distances.

dry-test and rain-test voltages, working voltage, and other data are given. Dimension diagrams and data are also included for various types of suspension and strain clamps, pins of various kinds and other insulator accessories. Views in the company's works and a description of the general process of insulator manufacture are also given.

Wagner Electric Manufacturing Company, St. Louis, Mo., has issued bulletins 101 and 102. The first of these is devoted to the latest types of the company's single-phase motors. Of these the BA type is a repulsion-induction motor, the BH type is a variable-speed motor and the BK type is the well known unity power-factor constant-speed motor. The bulletin describes each of these types in some detail, pointing out the characteristics and advantages of each. Illustrations are given showing parts of these machines, characteristic curves and typical installations for various purposes. Bulletin 102 is devoted to polyphase motors. Among these latter machines is the type BW motor, which is a self-starting motor that requires merely the throwing of a switch to put it into operation. The squirrel-cage induction motors are used in connection with a starting compensator or auto-transformer, which is also described. The wound-rotor type of motor is the variable-speed polyphase machine made by this company. The bulletin likewise describes each of these types, shows views of the motors and parts thereof and also various applications.

The Arrow Electric Company, Hartford, Conn., has ready for distribution catalog No. 16. This is devoted to a description and illustrations of "Arrow E" wiring specialties. The catalog is twice the size of the company's last catalog, issued in September, 1911. This enlargement is made necessary by the addition of many new devices, such as interchangeable socket fittings, outlet-box and sign receptacles, and snap and pull switches. These new devices, although containing original features, are all standard and complete the company's line of wiring specialties. The catalog is arranged in nine divisions devoted respectively to miscellaneous socket information, sockets, receptacles, flush snap switches, rosettes, miscellaneous devices such as outlet-box fittings, and a carefully arranged numerical index. There is so much valuable information relating to the use of sockets and their requirements with respect to distribution circuits that this catalog should be in the possession of everyone interested in the subject. Copies will be furnished by the company upon request.

Record of Electrical Patents.

Issued by the United States Patent Office, September 23, 1913.

1,073,585. Corset-Display Device. M. M. Beeman, assignor to Spirella Co., Meadville, Pa. Motor-driven turntable and oscillatory display stand.

1,073,589. Telephone-Exchange System. H. Browne, assignor to American Telephone & Telegraph Co. Includes automatic rotary selective switches for picking out an idle trunk.

1,073,594. Egg-Tester. G. T. Cripps, Toronto, Ont. Contains an electric lamp and reflecting mirror.

1,073,596. Electric Cable. H. C. Egerton, assignor to Western Electric Co. Special sheathed joint for steel-armored and lead-covered cable.

1,073,598. System of Electric-Current Distribution. C. Le G. Fortescue, assignor to Westinghouse Electric & Mfg. Co. Comprises groups of similar transformers, inductive means for connecting the transformer terminals of each group in pairs and a single-winding auxiliary transformer connected between groups.

1,073,601. Electric Battery. W. S. Gould, New York, N. Y., assignor to Gould Storage Battery Co. The element is divided into several groups, each of which has separate terminals and can be removed without disturbing the remainder of the element.

1,073,617. Oscillating Fan Motor. W. N. Motter and F. S. Kochendorfer, assignors to General Electric Co. The oscillating mechanism includes a vane, which is alternately swung to either side of the axis of the fan.

1,073,619. Electric Fuse. T. E. Murray, Jr., New York, N. Y. A fuse switch in U-form, having its blowing point localized in the crossbar.

1,073,624. Breaking Means for Radiotelegraphy. E. N. Pickerill, assignor to Marconi Wireless Telegraph Co. of America. Comprises a switch operated by the sending key and open-circuiting the receiving leads close to the receiver, a jump gap being shunted across the receiving leads near the switch.

1,073,632. Electrical Measuring Instrument. L. T. Robinson and O. Holz, deceased, by M. D. Holz, executrix, assignors to General Electric Co. A power-factor indicator with three coils and means, comprising resistances and a reactance, for producing a rotating field and for automatically rendering the indications independent of frequency.

1,073,639. Light Reflector. O. Shiras and F. X. Chassaing, assignors to Shiras Electric Co., St. Louis, Mo. Has curved and hinged cover pieces over the lamp and a flange holding a bottom glass plate.

1,073,641. Apparatus for Preserving Organic Substances. W. L. Smith, Pittsburgh, Pa. Motor-driven exhaust pump for refrigerator car.

1,073,643. Brush-Holder for Dynamos. H. Steinhart, assignor to firm of Robert Bosch, Stuttgart, Germany. Has a longitudinal and a transverse bore arranged to join the brush and terminal cable.

1,073,645. Process of and Apparatus for Progressive Electrostatic Separation of Comminuted Materials. H. M. Sutton, W. L. Steele and E. G. Steele, Dallas, Tex. Consists in alternately subjecting the material to electrostatic charges of varying stress.

1,073,658. Suspension Clamp. G. H. Bolus, assignor to Ohio Brass Co., Mansfield, O. Comprises a pair of integrally formed hooks with shanks on opposite sides of the conductor and a clamp block between the shanks.

1,073,662. Means for Controlling Synchronous Machines. J. Burke, assignor to Burke Electric Co., Erie, Pa. A synchronous motor is brought up to speed by an auxiliary induction motor in series therewith.

1,073,667. Telephone Transmitter. H. C. Egerton, assignor to Western Electric Co. Hard felt washers are carried by the diaphragm for sealing the granule-containing cups.

1,073,670. Strap or Connection for Secondary or Storage Batteries. B. Ford, Philadalphia, Pa. A lead-covered copper strap with heavy perforated lead terminals.

1,073,675. Means for Regulating Receptor-Clocks. G. A. Goodson, Minneapolis, Minn. A clock-setting mechanism sensitive to Hertzian waves.

1,073,677. Primary-Battery Cell. J. H. Gugler and G. W. Colles, Milwaukee, Wis.; said Colles assignor to said Gugler. Has a depolarizer consisting of a solution of chlorate and an extra supply of undissolved chlorate supported at a variable elevation in the solution.

1,073,680. Semaphore Signal. L. A. Hawkins, assignor to Union Switch & Signal Co. Has an electric motor for driving the arm to caution and to clear positions.

1,073,684. Electric Furnace. J. Hess, assignor to Bosnische Electricitats-Actiengesellschaft, Vienna, Austria-Hungary. Includes vertical electrodes, a charging shaft surrounding them and a gas-discharge outfit connected to the upper part of the shaft.

1,073,692. Current-Transmitting Instrument. C. D. Lanning, Boston, Mass. A telephone repeater with microphone and means for intermittently rotating the latter to maintain the carbon granules in unpacked condition.

1,073,699. Spark Plug. J. W. Nance, Twin Falls, Idaho, assignor of one-fourth to H. W. Wilson. Provides a series of spark gaps.

1,073,707. Time Switch. S. I. Phelps, Buchanan, Mich. Includes a motor-driven rotary member and a detent.

1,073,708. Receiver-Holder for Telephones. H. C. Raiber, Pittsburgh, Pa. Holds the receiver to user's ear.

1,073,722. Combination Gas and Electric Outlet Clamp. C. M. Wheelock, assignor to New Process Specialty Co., Milwaukee, Wis. For holding a flexible conductor on each side of the gas pipe.

1,073,747. Means for Attaching Dynamo-Electric Machines to Velocipedes and the Like. F. Eichert, assignor to the firm of Greif & Schlick, Coburg, Germany. Clamp and bracket for supporting the dynamo on the front fork.

1,073,748. System for Dividing Calls Among Telephone-Operators' Positions. H. J. W. Fay and E. C. Molina, assignors to American Telephone & Telegraph Co. Automatic switching system for connecting a calling line to an idle operator.

1,073,753. Galvanic Battery. J. Haigh, Muskogee, Okla., assignor of one-half to J. H. Childers. Comprises an electrode in the form of a

container having a threaded upper portion, a threaded cap mounted thereon, star-shaped glass plates having central recesses and a cylindrical electrode within the glass plates.

1,073,788. Telephone Outfit for the Deaf. K. M. Turner, Jamaica, N. Y. A lady's bag contains a battery, a transmitter with its diaphragm close to the outer wall, and a receiver and cord. (See cut.)

1,073,792. Pneumatic-Electric Piano-Player. G. Buechner and H. Semrau, Schenectady, N. Y. Has a motor switch mounted on a diaphragm on the air chamber.

1,073,801. Unloader and Starter for Compressors and Pumps. E. Friedrichs, Barmen, Germany. Includes pressure-controlled switches for the motor circuit.

1,073,823. Device for Synthesizing Gases. W. Siebert, assignor to Elektrochemische Werke G. M. B. H., Berlin, Germany. An electric-flame discharge furnace with two electrodes located in different planes, and means for introducting gases tangentially to the arc between the electrodes whereby the arc is rapidly rotated to form a surface of revolution.

1,073,863. Means for Selective Signaling. I. F. Manny, assignor to Selective Signal Co., Milwaukee, Wis. Includes a motor-driven toothed rotary member, a magnetically operated pawl producing escapement thereof and a signaling circuit closed by the rotary member in one of its positions.

1,073,868. Electrolytic Apparatus. M. Perreur-Lloyd, Boulogne-sur-Seine, France. Comprises cathodes and anodes of rigid carbon or lead plates, the anodes being circular disks mounted upon a horizontal shaft for rotation and the cathodes being suspended between the anodes.

1,073,870. Device for Synthesizing Gases. W. Siebert, assignor to Elektrochemische Werke G. M. B. H. Modification of No. 1,073,823 in which the gases are supplied tangentially in the middle of the surfaces of revolution between the two electrodes. (See cut.)

1,073,886. Telegraphy. W. M. Bruce, Jr., assignor to United Telegraph & Cable Co., Springfield, O. Alternating-current system with slow relay in local circuit responding to interruptions of low frequency.

1,073,926. Electrically Heated Garment. A. Pollak, Paris, France. A glove with heating elements around the fingers.

1,073,935. Electric Switch. F. Schneider, assignor to Van Horn & Dutton Co., Cleveland, O. A spring operates the rotary bridging piece.

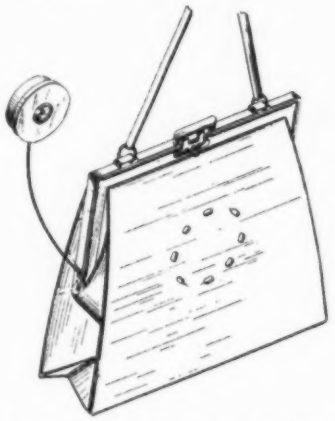
1,073,955. Attachment-Plug Fitting. F. V. Burton, assignor to Bryant Electric Co., Bridgeport, Conn. Comprises plug and outlet terminals and a latching ring with lugs for securing it on the head of the plug. (See cut.)

1,074,003. Alarm Attachment for Doors and Windows. T. L. McGovern and F. W. Allen, San Francisco, Cal. Electric alarm.

1,074,024. Traffic and Rear-End Signal Lamp. H. W. Sweeting, Auburn, N. Y. An automobile signal with several electric lamps of different colors.

1,074,057. Automatic Change-Over Switch for Wireless-Telegraph Receiving and Sending Apparatus. W. L. Lewis, Philadelphia, Pa. The movable contact is connected to the aerial and is electromagnetically controlled.

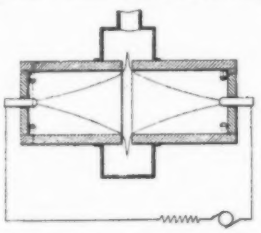
1,074,068. Electromagnetic Ore-Separator. G. Rietkötter, Hagen, Germany. Has an opposed pair of magnets supported on the shaft.



1,073,788.—Telephone Outfit for Deaf.

1,074,071. Make-and-Break Mechanism. H. A. Tepel, Jeffersonville, Ind. Comprises a wire, a shoe thereon, a chamber connected therewith containing a fluid conductor, an inner chamber containing a solid conductor and provided with admission and emission openings.

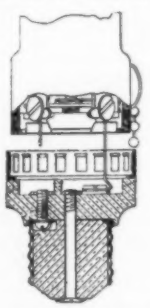
1,074,088. Electrode-Supporting Rod for Electrolytic Tanks. P. Jensen, Perth Amboy, N. J., assignor of one-third each to L. Goldberger and J. Kudrik. Has a number of helical electrode-engaging edges.



1,073,870.—Electric Flame-Discharge Furnace.

Reissues.

13,618 and 13,619. Arc Lamp. T. L. Carbone, Charlottenburg, Germany. Original No. 975,935, dated Nov. 15, 1910. The inner globe for an inclosed flame arc is divided into a number of superposed chambers, the one around the arc being heated to such a high degree that light-obstructing deposits do not condense therein.



1,073,955.—Attachment-Plug Fitting.

Patents That Have Expired.

Following is a list of electrical patents (issued by the United States Patent Office) that expired September 29, 1913.

568,323. Manufacture of Graphite. E. G. Acheson, Monongahela City, Pa.

568,335. Signal Box. C. W. Cornell, East Orange, N. J.

568,346. Telephone Mechanism. J. L. Given, Stony Point, N. Y.

568,350. Alternating-Current Electric Motor. F. S. Hunting, Fort Wayne, Ind.

568,370. Electric Alarm for Steam Gages. A. Ransom and A. J. Carrothers, Wise, W. Va.

568,408. Means for Attaching or Detaching Electric-Light Globes. F. W. Mayer, Hartford, Conn.

568,414. Armature Winding. S. H. Short, Cleveland, O.

568,415. Flat Winding for Armatures. S. H. Short.

568,444. Electric Weather-Indicator. W. M. Kelch, Dayton, O.

568,447. Secondary Battery. F. King, London, England.

568,450. Electric Switch. J. E. Meek, New York, N. Y.

568,451. Electric Thermostat. J. E. Meek.

568,458. Tandem-Parallel Controller for Induction Motors. W. B. Potter and F. E. Case, Schenectady, N. Y.

568,459. Extinguishing Electric Arcs. W. B. Potter, Schenectady, N. Y.

568,464. Constant-Potential Alternating Generators. C. P. Steinmetz, Schenectady, N. Y.

568,473. Synchronizing Device for Electric Clocks. W. J. Cruyt, Brussels, Belgium.

568,493. Automatically Testing Fire-Alarm Circuits. L. G. Rowand, Camden, N. J.

568,494. Electric Fire-Alarm Circuit and Signal Box. L. G. Rowand.

568,495. Fire-Alarm Circuit. L. G. Rowand.

568,513. Telegraph Receiver. C. L. Buckingham, New York, and E. Germann, Brooklyn, N. Y.

568,514. Perforator and Circuit-Controlling Apparatus Therefor. C. L. Buckingham and E. Germann.

568,523. Trolley System for Electric Railways. C. E. Davis, Chicago, Ill.

568,526. Substance for Telephone Electrodes. D. Drawhaugh, Eberly's Mill, Pa.

568,527. Telegraph Sounder. D. M. Dunn, Abington, Va.

568,566. Construction and Operation of Circuits for Electric Motors. F. E. Herdman, Winnetka, Ill.

568,567. Electric Elevator. F. E. Herdman.

568,568. Elevator-Motor Controlling Device. F. E. Herdman.

568,569 to 568,571. Brake Mechanism for Electric Elevators. F. E. Herdman.

568,606. Electric Signaling Apparatus. A. Garins, Carlstadt, N. J.

568,608. Alarm Device for Electric Motors. W. A. Gibbs, Pawtucket, R. I.

568,650. Electric Track-Circuit Rail-Joint. G. H. Williams, Fort Smith, Ark.

568,668. Electric Bell. F. Davey, Detroit, Mich.

568,675. Telegraphy. R. Greville-Williams, Heywood, England.

568,682. Electromagnetic Adhesive Device. A. A. Honey, Tacoma, Wash.

568,713. Rail-Bond for Electric Railways. C. C. Benson, Covington, Ky.

568,721. Electric Arc Lamp. W. Jandus, Cleveland, O.

Electric Vehicle Section

Electric Vehicle Association of America.

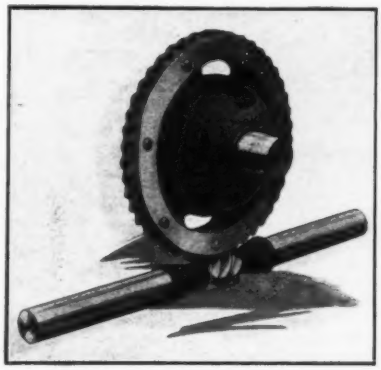
The first fall meeting of the Electric Vehicle Association of America was held at the Edison Auditorium, 44 West Twenty-seventh Street, New York, on Tuesday, September 23 at 8 p. m. The subject of the evening was presented in a paper by F. J. Ryan of the *Commercial Vehicle*, in a paper entitled "The Value of Power Wagon Operation to the Community."

With delegates from the Pacific coast, the South, New England and the Middle West, the fourth annual convention of the Electric Vehicle Association of America, promises to be not only the largest but the most interesting and important in the brief history of the organization. The convention will be held at the Hotel LaSalle, Chicago, on October 27-28 and in addition to the business sessions, there will be an interesting exhibit of the latest models of electric vehicles and the newest in automobile accessories.

It is interesting to know that this association, which is hardly three years old has grown to a membership of 450, representing the leading manufacturers of electric vehicles, the electric power companies of the largest cities, the manufacturers of electric vehicle supplies, members of the faculty of technical schools, and even the users of this type of vehicle. And during the brief history of the association the number of electric vehicles in operation has increased 30 per cent, an increase that is directly traceable to the influence of the association, through its fifty thousand dollar advertising campaign that is carried on each year.

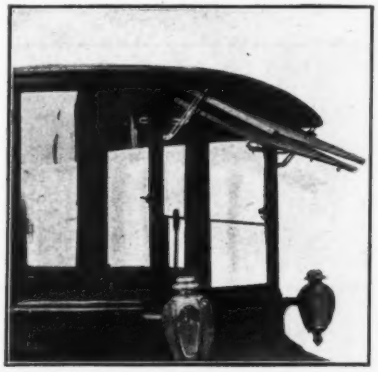
Representatives of all these interests will participate in the coming convention. They will come from Los Angeles and Boston, San Francisco and Providence, Denver and Hartford, Detroit and Philadelphia, New York and Cleveland, Dayton and Buffalo, St. Louis and Rochester, Baltimore and Columbus, and many other of the smaller cities that are represented in the membership of the association.

Some idea of the work that will be accomplished may be had from the program of the two days session. Arthur Williams of New York in his presidential address will tell in detail the work that has been accomplished and what the association aims to do in the future. A member of the Baker Motor Company will speak on "Electric Vehicle Salesmanship;" a representative of Gimbel Brothers' New York store will tell "Why We Adopted the Electric



Daimler-Lanchester Worm Gear for 1914 Detroit Electrics.

Vehicle." F. E. Whitney, of Philadelphia, will report on "Electric Vehicle Tires," and "The Charging of Storage Batteries in Unattended Garages" will be the subject of a paper by M. R. Berry. "The Merchant, the Central



Hanlon Patented Rain-Vision Shield for 1914 Detroit Electrics.

Station and the Electric Truck" will be the subject of a paper by F. Nelson Carle, advertising manager of the General Vehicle Company. E. S. Callahan, of H. M. Byllesby & Company, Chicago, will talk on "Co-operation Between Electric Vehicle Manufacturers and Central Stations." The effect of the electric vehicle on insurance rates will be explained by a member of the Philadelphia Board of Fire Underwriters. Other speakers will be Hayden Eames and Ralph Temple.

There will be dinners for the delegates, special entertainment at the hotel and trips about the city for the purpose of studying electric vehicle operating conditions, the traffic regulations and the garage system of Chicago.

It is expected that two hundred of the delegates will come from New York and Boston alone, and for these special trains have been chartered. F. N. Carle has been appointed Master of Transportation.

The fourth annual meeting of the association, which, in accordance with the constitution and by-laws, has been called for October 14 at New York City, will, in the absence of a quorum, be adjourned to meet at the Hotel LaSalle, Chicago, at noon, October 28.

Electrics for 1914—Advanced Models.

Many makers of electrics, like the builders of a number of gasoline cars, have discontinued the effort to establish radical changes in the period characteristics of their cars. As William C. Little, sales manager of the Borland-Grannis Company, puts it, "have adopted a custom of adding improvements as soon as it has been proved to the entire satisfaction of the makers that these features really add to the value and efficiency of the cars." Thus there is no wait from year to year, or from one season to another to make changes that may seem beneficial. However, the approach of another year makes seasonable some reference to the new offerings which several of the leading makers of electrics will have available.

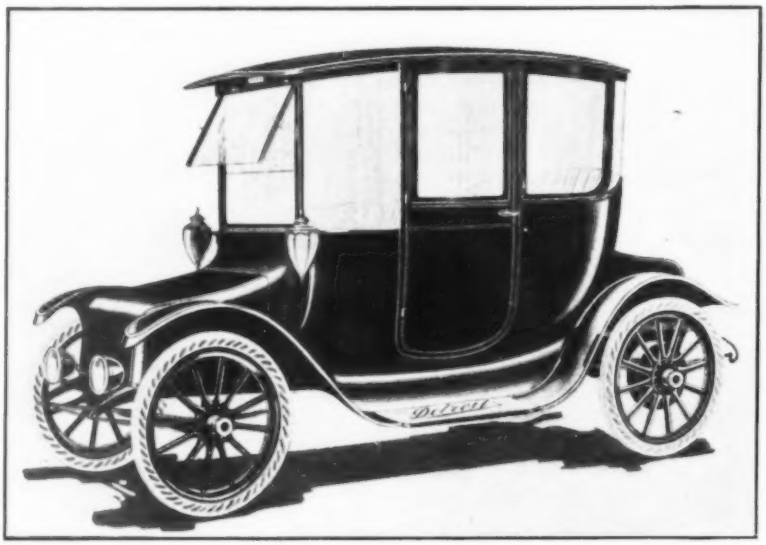
Detroit Electrics.

The latest product of the Anderson Electric Car Company's factories is announced. The 1914 Detroit electric line is most comprehensive, embracing five-passenger brougham, four-passenger brougham, roadster, victoria, and limousine models. Every type of electric pleasure car appears and all are of elegant and beautiful design.

Simultaneously, the Anderson Electric Car Company announces a general reduction in the prices. This is possible because of the great number of cars now being manufactured in their plants. Due to this volume, the prices have been low-

ered and at the same time, the quality of the cars has been improved.

All models are of longer wheel base, 12 feet shorter turning radius; have larger tires; larger brakes; increased battery capacity (washing unnecessary); all battery cells accessible by raising hoods.



Detroit Model 45-Forward Drive Five-Passenger Brougham.

Several models are fitted with the electric hand brake and the Hanlon patented rain-vision window. A choice is also given of the bevel-gear axle or an imported worm-gear axle.

The Daimler-Lanchester imported worm-gear has been adapted for 1914 Anderson electrics. It is silent, and efficient. The worm is placed below the worm-gear, a feature which the company claims is an advantage over the ordinary method of mounting. Positive lubrication is secured, through the worm resting continually in a bath of oil.

The Detroit duplex-drive car, fitted with the worm-gear axle, is an attractive brougham of 100-inch wheel-base. As indicated by the name, this electric may be driven from either the forward or the rear seat. The roomy, luxurious interior provides seating capacity for five passengers. It has a rear seat 52 inches wide and two chairs forward, of the revolving Pullman type. All the latest refinements are in the interior, including eight-day clock, sunburst lights, Weston meter, Warner speedometer, smoking set, cut glass vases, etc. This model is also fitted with the new aluminum curved oval fenders. All models are heavily upholstered and supplied with deep Turkish cushions. The price of the Detroit duplex-drive car is $3,000 f. o. b. Detroit.

The Hanlon patented rain-vision window is a portion of the equipment of several models. This double-pane rain-shield gives the driver and other occupants of the car absolute protection under all weather conditions. A clear view ahead is secured, as rain, snow or sleet can not beat against the front pane. The rear portion of the shield is adjustable from within the car to secure ventilation. In event of very cold weather both panes are closed and due to the dead air space between them frost can not form on the windows.

Model 47 Detroit electric is a four-passenger brougham of similar chassis and equipment as Model 48 with the exception that it is driven from the rear seat and has one revolving Pullman chair in the front right-hand side. Price, $2,850 f. o. b. Detroit.

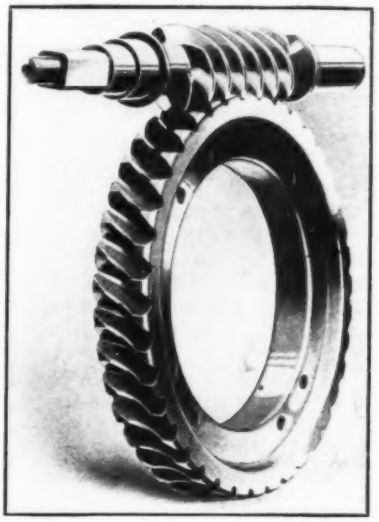
Model 46 gentleman's roadster, is a fine open vehicle of sweeping lines, roomy, luxurious interior and is on the same chassis as Models 48 and 47. It is also fitted with the worm-gear axle. Price, $2,500 f. o. b. Detroit.

The following 1914 Detroit electrics are fitted with the bevel-gear axle: Model 43, four-passenger brougham, rear seat drive, price $2,550, f. o. b. Detroit; the Model 44, ladies' open victoria, price, $2,300, f. o. b. Detroit; and Model 45, five-passenger brougham, forward drive, price $2,800, f. o. b. Detroit.

All of the 1914 cars are of the same quality and workmanship, possess clear vision features with curved glass corner panels, full aluminum bodies and fenders and Detroit electric shaft-drive chainless power plant.

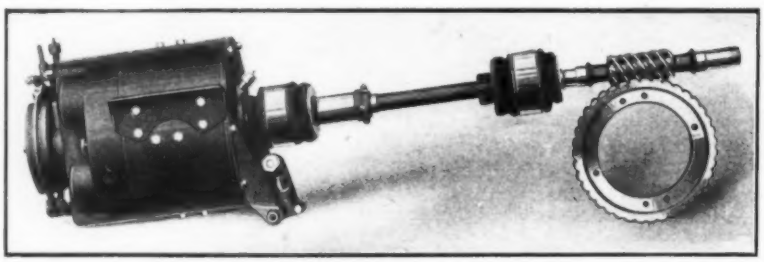
Rauch & Lang Worm Gear Drive.

The Rauch & Lang worm drive is



Rauch & Lang Worm-Gear Drive.

the result of extended research and scientific experiments by the company's engineers. This gear permits the use of a light-weight, high-speed motor, with one reduction between the motor and the rear wheels. A torsion rod, parallel with and below the propeller shaft, connects the rear axle with the motor, and takes all torsional or turning strains to which the axle is subjected when under power.



Rauch & Lang Power Plant and Transmission.

The forward end of the torsion rod is connected by means of a ball and socket joint with the top of the torsion rod link, which in turn swivels on the rear motor yoke. The rear end of the torsion rod is taper fitted into a nickel-steel forging, which sets into a vertical taper bearing in the front end of the axle housing.

The worm and worm gear are mounted in a single casing and all adjustments are made at the factory to secure perfect alignment and absolute

G. V. Electrics *at the* New York Electrical Show

YOU will find our exhibit at the Grand Central Palace, October 15th to 25th, 1913, in booths 77 and 78. Here we propose to show the following:

One 1000-lb. G. V. Wagon, 1901 type
One 1000-lb. G. V. Wagon, 1907 type
One 2-ton G. V. Chassis, 1913 type
One 1000-lb. G. V. Chassis, 1914 type
One 1000-lb. G. V. Wagon, 1914 type

The last two vehicles mentioned will be chainless. Don't fail to carefully examine the new G. V. *worm drive* wagon and the exclusive G. V. refinements on the 2-ton chassis.

Those wishing to see a demonstration of our new worm drive wagon on the inside automobile track may do so by applying at the desk in our exhibit.

General Vehicle Company, Inc.

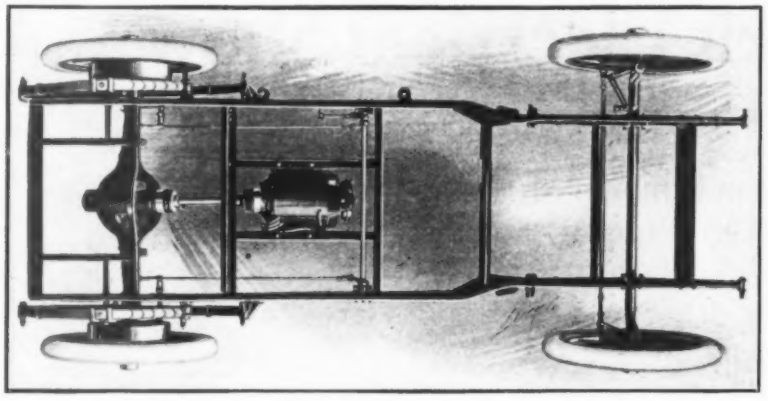
General Office and Factory

Long Island City, N. Y.

New York Chicago Boston Philadelphia

(We shall also exhibit at the American Electric Railway Manufacturers' Association Convention, Atlantic City, N. J., October 13th to 17th, 1913)

silence in running. The axle is then assembled and the worm and gear mounting is so enclosed that it cannot be adjusted from without. Ample provision is made for filling, gauging and draining the oil in the rear axle housing. Great care has been taken in selecting and treating the various kinds of steel used in the parts that make up the axle casing and tests show that it will support a load of fifteen tons on the spring seats without a permanent deflection.



Rauch & Lang Chassis, Showing Mounting of Power Plant and Gear Case.

The Rauch & Lang-Hertner high-speed motor is retained, but where it has been connected to the propeller shaft through a silent chain reduction, the propeller shaft is now fastened directly to the end of the armature shaft through a universal joint. The second universal joint is on the forward end of the worm shaft. The rear of the motor is tilted slightly upward and the front of the axle is tilted correspondingly downward so that with normal load the motor shaft, propeller shaft, and worm shaft are in a straight line with each other. Accurate tests made by the company's engineers show that the employment of a pair of universal joints under these conditions, while permitting perfect flexibility and freedom, the power loss, due to them, throughout the range of spring action is inappreciably small.

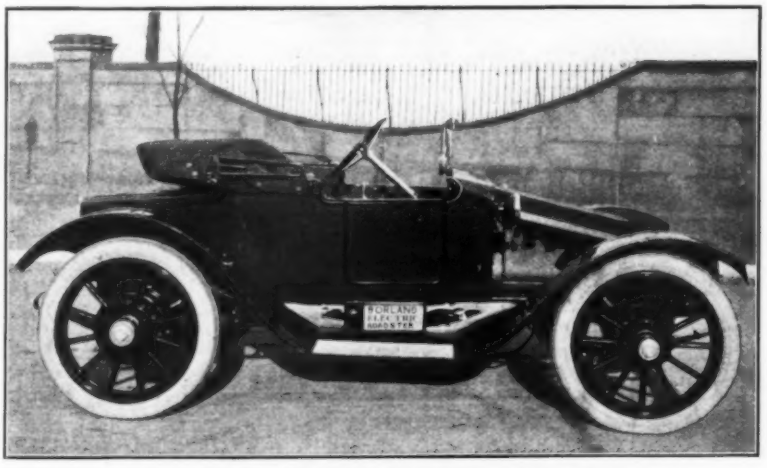
The Borland & Grannis Roadster.

A snappy looking car of well deserved popularity is the Borland Model 52 roadster. In its up-to-the minute design it has all the advantages of appearance, and it also possesses all the comfort, cleanliness, ease of control and low up-keep of the rightly-built electric as well.

The Borland roadster has a wheelbase of 96 inches permitting a body unusually roomy for this type of car. As on all other Borland electrics a special non-arcing controller is used, with patented interlocking device attached to the brakes and cutting off the current the moment the brakes are applied.

Wheel steering is urged on this type of open car, although seldom recommended on the closed body designs. In the Borland type of wheel-steer, the power is controlled by hand—with ease and certainty. An accelerating pedal, however, may be pushed with the foot, thereby increasing each of the six speeds ten per cent—a decided advantage on crowded thoroughfares.

The Borland roadster is fitted with 42-cell, 11-plate Exide batteries, and it attains a speed of 35 miles an hour with great mileage capacity. Its equipment includes many of the features of the coupe, together with a mohair cape top with sidedoor curtains, slip covers and Klaxonet horn.



The Borland-Grannis Model 52 Roadster—a Regular Car.

Baker Electrics Take Honors at Cleveland.

An imposing feature of the Perry Centennial Celebration recently concluded in Cleveland was the 15-mile parade in which over 1,000 automobiles participated. At the head of the automobile section, a singularly interesting exhibit showed the chronological development of the world's oldest electric automobile.

Leading the line was the first Baker electric built, carrying a sign showing the date of manufacture, 1899. Driving the car was the oldest Baker electric employee costumed as "Father Time." Following in order were the succeeding models of the Baker Company, each car marked with the date of manufacture and showing the year's advance in the development of the modern car. At the rear of the line were the three up-to-date models, roadster, coupe and brougham. These cars were not marked with the date of manufacture as the Baker Company no longer adheres to yearly models.

The Oldest Baker Electric and the Oldest Baker Electric Employee Leading the Automobile Division at the Perry Centennial at Cleveland.

The big brougham, which was the last car in the Baker line-up, captured first prize for the best decorated elec-

tric in the parade. It was beautifully covered with gold and blue and hung with sprigs of orange blossoms. One hundred little electric bulbs outlined the exterior of the car. Under the glow of the inside lights a beautifully gowned bridal party rode in the car.

In addition to the first and third prizes for decoration, the Baker Company took first prize for having the largest number of cars under 110-inch wheel-base in line.

The Value of the Electric Vehicle to the Central Station.

At the convention of the New England Section of the National Electric Light Association held at Burlington, Vt., September 17-19, one of the interesting papers was that presented by W. H. Snow and David W. Beaman, of the New Bedford (Mass.) Gas and Edison Light Company, entitled "The Value of the Electric Vehicle to the Central Stations." The authors point out the advantages to the central station of securing the charging of storage batteries on electric vehicles as an off-peak load, and, according to their figures, show that there are more electrics in use in Chicago and New York than in all of New England. The feature of this paper, however, is the answer that is made, in the shape of direct testimonial, to the question as to the attitude of the user to the electric vehicle. Some of these answers are as follows:

A manufacturing company in one of the mill towns of northern Massachusetts writes:

"We have had two electric trucks in use for upwards of two years, and while we have had to make repairs more or less, in the main, they have given good satisfaction. We find they handle the work much better and quicker than horses possibly could, which allows us to take care of a great volume of work, which we could not possibly do under our old system of horses."

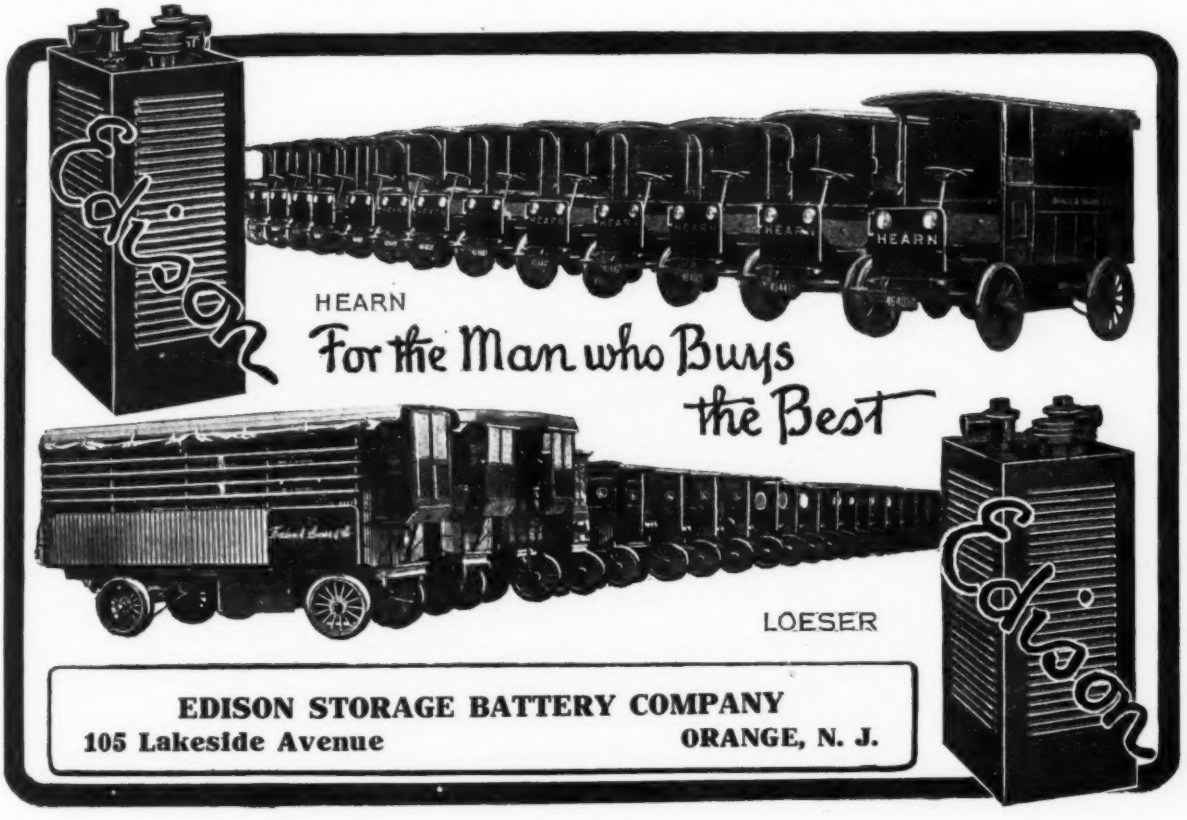
Another manufacturer in Pawtucket Rhode Island, writes:

"We have had two electric two-ton trucks in service for some time, one coming into service in July, 1912, and the other in April, of this year. We have found them dependable at all times, and the maintenance charges are very low. Number one was taken out of service for three days after running 5,200 miles and new bushings were put in steering post, two segments replaced in the controller and the battery solution renewed.

"The total maintenance charges on this machine did not exceed $100 up to the present time, including tires. The second machine has not yet needed repairs. We charge nights and boost at noon and average about 20 miles a day for each truck. Before buying trucks we had six horses and now our stable is for sale, lease or to let, for we have a new garage across the street. We have also two electric passenger cars in service. We have found that electric vehicles fill the bill in fine shape for us and we will help 'boost' the electric."

An electric light company writes:

Baker Electrics Show Evolution of Automobile in Perry Centennial Parade at Cleveland.



"Our electric machine is used in the day time by the construction foreman, who averages close to 700 miles in a month, and at night by our night patrolman, who at this season of the year averages very close to 1,000 miles a month. It is put on charge at about 11 o'clock every night and left on until full; it is taken out by the construction foreman at 8:30 in the morning and run until noon, when it is put on again for about an hour, then at five o'clock it is put on charge until about 7:30 p. m., when the night patrolman takes it out.

"We have been giving this car a lot of work to do, to see how it would stand up under unusual conditions, and so far we have been very much pleased with its performance. We hope to be able to purchase another some time next year for the use of our construction foreman only, so that the present car can be kept for the use of the night patrolman."

We quote from a teaming concern in Hartford, Connecticut:

"We have used a one-ton electric commercial car since June 10, 1912, and up to June 10, 1913, one year, it had run 10,501 miles and earned $2,650.17. We used this car in connection with about 50 horses in a general teaming business; using this for the long, hard runs, with a view to saving the horses rather than showing large returns. In all large teaming businesses, there is an ever-increasing number of long and longer deliveries which go in with the short-distance deliveries and all pay the same price for delivery, so by taking out these long runs which are done at a loss, and giving the horses short runs, which pay well, it is rather unfair to the power wagon, but with this handicap it has earned us 30 per cent profit above all known or estimated expense, including depreciation, average upkeep, insurance, liability, interest, taxes tires, etc. Before we had this power wagon we used three horses to two wagons, one horse resting. Since we have had this power wagon the third horse is working, as the horses do not get the long runs and are in better condition than before we had the 'horse saver.' Now you ask me what I think of it. What would any business man think of an advance that would pay him 30 per cent net, and would pay that on work that was done at a loss with the horses?

"How do they compare with gasoline trucks? They are simpler to handle and there is no engine to wear out. Strong advocates of gasoline trucks are replacing them with electrics for local deliveries of fifteen miles or under from home. We feel confident that in a short time battery stations will be located in all the principal cities and an electric car can go anywhere its owner cares to send it by exchanging batteries at any station. It is perfectly feasible and is coming."

A large meat packing establishment in Chicago, Illinois, writes:

"A 3½-ton electric truck went into commission on November 30, 1910, and had covered 9,421 miles up to November 30, 1911. During this period the truck has been in service every working day making deliveries of meat to down-town points in Chicago, and to such suburban points as Oak Park, Kensington and Dunning. The average load carried has approximated the rated capacity of the truck. During the very hot weather this truck was performing the work of three teams, covering anywhere from 45 to 55 miles per day. The driver states that he had no difficulty at all in making 45 miles and picks out the following figures, namely, 49, 50.1, 52.4, 55 and 59 respectively as proved."

One expense which they were put to during this interval was the renewal of tires, and the replacing of the Morse chains after approximately 7,000 miles of service.

A hat manufacturer in Philadelphia, Pa., writes:

"We beg to say that not only has our electric truck given us good satisfaction, but we do find that in the five years that we have had it, it has been subjected to very severe tests, all of which it has stood exceedingly well, and while, of course, there have been minor repairs made from time to time, these have been very small in amount and it gives us great pleasure indeed to recommend the electric truck to the use of the public."

A large electric manufacturer in New York writes:

"We desire to express our complete satisfaction with the 2-ton electric truck which we purchased about a year ago and which is showing a remarkable saving in our cost of transportation. We have at hand a memoranda of the last 280 days of operation, which shows the following:

Truck carries.....1,483,375 pounds
Average pounds per day .....5,297 3-4 pounds
Distance traveled.....8,605 miles
Average miles per day....30 6-7 miles

"Our trucking system shows that this was done at a cost of $833.08 less than we are able to do with our horse-drawn equipment, which is a remarkable demonstration of the 'economical and working capacity of the electric vehicle.' We might add that this truck has more than met our expectation in points of economy and reliability."

The following was received from a hardware manufacturing company of Pittsburgh, Pa.:

"We still have in daily use the five-ton electric truck bought seven years ago, and it is giving us the same satisfaction it has given us during its entire service. While the truck has had what we consider a long life, it is today in excellent condition and seems good for many years to come."

A trust company in Cleveland, Ohio, writes:

"It would seem that there is nothing better we can say than to recall the fact that we purchased our second machine after some six or seven years' service."

The following was written by the president of a machine company in Boston, Mass.:

"We will turn the letter of inquiry over to our general management department for attention as I know nothing about the details you call for except that our vehicle seems to be still running about the streets at all hours and times and in all kinds of weather, much to my surprise."

A furniture company in Kansas City, Mo., writes:

"We take pleasure in sending you herewith our order for another 2-ton electric truck to be delivered as soon as possible. Our electric vehicle equipment is steadily increasing this being the third machine we have purchased. We find electric delivery service efficient and economical and expect to do away with our entire horse equipment in the near future."

The following from a railroad transportation company in New York:

"Regarding the experience which we have had with the electric which was built for us nine years ago, would say that it has been very satisfactory and there has been no time that we would have changed back to the horse vehicle, for economical or any other reasons. Of course, at that time the art of building cars and batteries was not so well understood as now, and there are some things about our old car which we would like to have a little different, but we are satisfied, barring little things which have since been corrected, and we have used the car every day for nine years. I hope to send an order very soon for one of the latest models."

A light and heavy teaming concern in Methuen, Mass., has sent the following letter:

"In regard to our 3½-ton truck which we purchased six months ago, will say that it has proven satisfactory. The truck has drawn the greater part of our supply ice from ice houses to the delivery wagons, which is a round trip of five miles. The truck has also drawn the greater part of our ice from the houses to the yard for the loading of the teams and for the start the next day, a distance of two miles, and return, making another distance of two miles loaded. So far as the actual difference in figures is concerned we are not able to state as we have not figured them, but can easily say the truck has a great advantage over horses and we recommend them for use."

A transfer company in New York writes:

"We beg to state that the entire cost in connection with the three and one-half ton truck purchased by us over 16 months ago, for the last year of that time was $3,353.84. This covers insurance, repairs, new tires, new batteries, and wages. I might add for your information that in putting this truck in service, we put out of service two double wagons, the cost of which for the same period, would have been $4,-694.60, or a saving in favor of the truck of $1,340.76."

A dealer in meats and lard in Cedar Rapids, Iowa, furnishes the following:

"We are very glad to be able to advise you that during the eighteen months in which we have had in operation two electric trucks, a one-ton and a five-ton vehicle, we have been entirely satisfied with the results which we have obtained from their use. Outside of renewals of various batteries and parts, we have had no expense whatever in connection with these trucks.

"The conditions under which we have been operating these trucks are peculiar to our own business and on this account we do not believe that the figures showing cost of maintenance and operation, would be of any service

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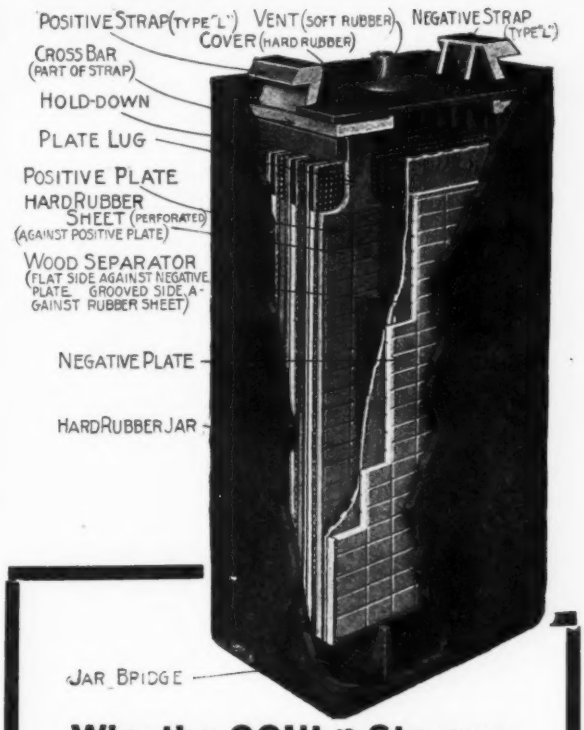

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to you. We are, therefore, not sending these figures."

A banking concern in New York City, in ordering a new 1,000-pound car, writes:

"Please deliver as soon as possible our new 1,000-pound car as we are tearing down our stable and need it very badly. It is now a year since we first started using electrics and they have proved so satisfactory that we are doing all our delivering with them. By the way, it was the splendid performance of the first 750-pound electric wagon we bought, which convinced us of the value of the electric. Our total operating cost for this wagon for the first 12 months was only $164.91. Now, as you know, we will soon have no horses whatever, but all electrics in our delivery service."

Electric trucks seem specially adapted to the brewery trade, and we are quoting from a number of letters from brewers throughout the country. One from New York City writes:

"It is with a genuine sense of satisfaction that we enclose you our check in payment of two electric trucks and charging equipment, the arrival of which at our brewery, at the beginning of the torrid wave when hundreds of horses were dropping in our streets from heat and prostration was almost providential. Moreover, the speed, promptitude and efficacy in our deliveries are such revelations that we have frequently chided ourselves because of our laxity in not utilizing them earlier, and unless our exuberance over these trucks thus expressed proves fallacious, we shall shortly dispense with horses as fast as time will permit."

Another from Cincinnati, Ohio:

"We still have in daily use the two five-ton electric trucks purchased in 1904. Besides these, we have one 3,000-pound wagon bought in 1905, two each of two-ton capacity about the same age and a lighter wagon purchased in 1907. While we are confident that modern trucks and wagons must be more efficient and economical than those of the vintage we have, we wish to express our complete satisfaction."

Another from New York City:

"We hereby place an additional order for six five-ton beer trucks and 12 three and one-half-ton carrying capacity bottled beer trucks. This order is given on account of the splendid results obtained both as to service and economy over horse hauling, by the use of six five-ton trucks built for us 15 months ago."

One from Dubuque, Iowa:

"We beg to say that eight years ago we installed a one-ton double wagon and two five-ton keg trucks which we are still using. The one-ton truck has been practically in constant service since its installation, and the five-ton trucks have been operated most of the time with the exception of some portions of the winter when we used our horses rather than let them stand idle in our stables. We have one trip which is made practically daily with the one-ton truck, carrying a full load, which consists of a seven-mile run and a climb of a 15 per cent grade, which is made without any trouble whatever. We start the larger truck on a 20 per cent grade with ease. Our cost of maintenance has not been excessive and we figure that we are doing the work at less expense than can be done with horses. We are charging off these cars at eight per cent per annum although we have no particular reason for using that figure as the cars have paid for themselves at this date. We believe that with ordinary care and attention the cars will last at least five years more, and aside from a slight difference in construction we consider them as good as new cars of the present type."

One from Newport, Kentucky:

"We have had six five-ton electric trucks in use during the last six or seven years. We operate them between our plant and railroad yards, about one mile distant. We have a splendid level road, in consequence of which our batteries are giving us excellent service, and our rubber tire trouble is small. In our case the trucks are doing excellent work in every way. These trucks have displaced at least thirty horses and probably twelve drivers, and as above stated, in our case the electric trucks are a great success."

One from La Crosse, Wis.:

"Our two-ton electric truck was put into service eight years ago and for the first five years we kept no record. We find, upon investigation, that our record on this machine from March 1, 1910, to October 2, 1912, shows an upkeep expense of $631.40. These figures cover tires batteries and replacements as well as labor incident to making these repairs. During this period the truck has covered a distance of 11,840 miles. A three and one-half-ton truck furnished us in March, 1912, has covered a mileage of 2,360 miles at an expense of $45. The above figures do not include current. In our experience the electric truck has proved more satisfactory and economical than a gasoline truck for city deliveries."

A beer concern in Philadelphia, Pennsylvania, writes:

"In regard to our experience with electric delivery vehicles, would say that we purchased the first one in November, 1903, since which time we have kept adding to our outfit until today we have 23. Our early results from these trucks were rather discouraging on account of the high cost of upkeep occasioned by the necessity of frequent renewal of batteries and tires. This expense was our chief criticism against them as otherwise they were splendidly adapted to our line of business, giving us facility for rapid and frequent delivery. As improvements in batteries and tires rapidly developed, our up-keep expense decreased until today we rely very greatly on our trucks to deliver our product, and only keep about half the number of horses we formerly did to help out when rushed. The average life of a battery of today is two to three times as long as those made seven years ago, and the same can be said of tires. Add to this the refinements introduced in the construction of electrics and improved motors and you have a logical explanation of why they are better for delivery purposes than horses. We are looking forward to the early delivery of the four trucks recently ordered in order that we can make further tests as to efficiency and economy of operation."

Boston Electric Motor Car Club Meeting.

The regular meeting of the Electric Motor Car Club of Boston on September 24 was held at the Engineers' Club in that city, about 35 being present. President Day Baker called the meeting to order after luncheon, and the following new members were voted in: William T. Brown, Firestone Tire & Rubber Company; J. Calvin Mackay, Westinghouse Electric & Manufacturing Company; John W. Queen, *Auto Journal.*

A list of officers and committees was presented by the nominating committee. These will be acted on at the next meeting. It was noted that Secretary H. F. Thomson will be unable to continue as an officer of the club, owing to engrossing duties along the lines of telephone investigation. Mr. Thomson is secretary and assistant director of the new division of electrical research at Massachusetts Institute of Technology. A new committee, the advisory committee, is added to the club's organization. Its duties are to confer with the executive committee and present suggestions for the welfare of the club.

E. S. Mansfield reported the activities of electrical vehicle interests at the recent convention of the New England Section, National Electric Light Association, at Burlington, Vt., and expressed his belief that great interest had been aroused on the subject.

The club registered its protest against a regulation of the motors and accessories manufacturers which seeks to bar out the exhibition of tires and batteries from the Boston Automobile Show the coming spring.

On suggestion of the editor of *The Electrician,* London, the club will entertain a delegation of European electrical men on their visit to Boston the coming spring in connection with the convention of the Municipal Electricians' Association, and proposes to take the visitors on a tour of Eastern Massachusetts by electric automobile.

A letter was read from F. Nelson Carle, of the Electric Vehicle Association of America, urging the club to interest members and others to go to the forthcoming convention of that body in Chicago. It is hoped that at least 15 will attend from Boston, and 75 from all New England. The club voted to send its business secretary, O. G. Draper, as a delegate.

R. M. Turner, of the General Vehicle Company, suggested the formation of a bowling league which shall include a team of electric truck users together with managers of transportation in Greater Boston, for contests with teams made up of agents, supply men and central-station men.